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Confronting AIDS: Evidence from the developing world

Selected background papers for the World Bank Policy Research Report, *Confronting AIDS: Public priorities in a global epidemic*

Edited by: Martha Ainsworth, Lieve Fransen, and Mead Over

Arnab Acharya

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Edited by
Martha Ainsworth, Lieve Fransen, and Mead Over

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Preface

The World Bank Policy Research Report *Confronting AIDS: Public Priorities in a Global Epidemic* (New York: Oxford University Press, 1997) makes a compelling case on economic grounds for developing country and international donor governments to become actively involved in confronting the AIDS epidemic and proposes a framework for prioritising government interventions, based on the principles of public economics, epidemiology, and public health. It draws on numerous published and unpublished studies, many of the latter commissioned specifically for the report.

This volume, *Confronting AIDS: Evidence from the Developing World*, puts in the public domain 17 previously unpublished studies commissioned as background for the World Bank report. Most of the studies were launched by the World Bank and the European Commission in early 1996. The first drafts were presented for discussion at an authors' workshop on 'AIDS and Development: The Role of Government', held in Limelette, Belgium, in June 1996, under the joint chairmanship of Lyn Squire of the Development Research Group of the World Bank and Lieve Fransen of the European Commission's Directorate-General for Development. The World Bank and the European Commission jointly sponsored the Limelette workshop and the commissioned papers.

Both the main report of *Confronting AIDS* and this volume of background studies are examples of the benefits of international cooperation in policy research in response to the AIDS epidemic. Both have benefitted greatly from the technical inputs, advice, and financial support of the European Commission, the World Bank, and UNAIDS, although the recommendations and conclusions of the main report, as well as those presented in the studies of the current volume, are those of the authors and do not necessarily reflect the positions of their respective institutions, the European Commission, or the World Bank.

Martha Ainsworth, Lieve Fransen, Mead Over
August 1998

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Introduction

As of the end of 1997, more than 30 million people worldwide were infected with HIV. Nine out of 10 people infected lived in developing countries, and two-thirds of those infected lived in the poorest countries of sub-Saharan Africa. The AIDS epidemic is an unfolding human tragedy worldwide that has particularly profound economic and social implications for developing countries.

While much has been written on the AIDS epidemic from diverse perspectives – public health, medical science, and human rights – the World Bank report *Confronting AIDS: Public Priorities in a Global Epidemic* (New York: Oxford University Press, 1997) makes the specific case that AIDS both is affected by and affects economic development. There are strong economic reasons why governments must be involved in confronting AIDS, and there are certain essential activities that only governments can undertake, enhancing the efforts of private actors, to slow the epidemic and mitigate its impact. In terms of prevention, these activities include: providing 'public goods', such as information about the spread of the virus and how it can be prevented; reducing the riskiest behaviour that raises everyone's risk of infection; protecting the rights of those most affected by the epidemic; and ensuring that the poorest in society have access to prevention services. In terms of mitigating the impact of the epidemic and given the limited public resources and the multitude of demands for them, governments must place the highest priority on protecting the health care sector and on strengthening existing antipoverty programmes.

This volume puts in the public domain 17 selected background studies that provided evidence for the World Bank report. The studies are organised into four groupings by topic: AIDS and development; prevention of HIV and the determinants of infection; the impact of AIDS on health systems; and the impact of AIDS on households.

AIDS and development

The first five chapters include material that informed the first chapter of *Confronting AIDS,* highlighting the two-way relationship between AIDS and economic development and the economic rationale for government intervention.

Because AIDS is still a fatal disease for which there is no cure, its most immediate development impact is on mortality, life expectancy, and population growth rates. Different models of the demographic impact of the AIDS epidemic in the hardest-hit countries have produced widely divergent predictions, at one extreme suggesting negative population growth rates, and at the other, a halving of current rates. In the first chapter, 'The future demographic impact of AIDS', John Stover evaluates the assumptions used by the US Bureau of the Census, the United Nations, the World Bank, and the Population Council in generating their estimates of demographic impact. He concludes that the four institutions use very similar methodology and that the differences in predictions are due to different assumptions about the future levels of HIV infection. In fact, HIV infection now has substantially exceeded the predictions of all four institutions in some countries, underscoring the arguments in chapters 1 and 2 of *Confronting AIDS* that HIV infection will impose a huge disease burden among adults in developing countries and that governments must not flag in monitoring the progress of the disease.

The relationship between AIDS and development runs in both directions, however. The second and third chapters highlight the effect of economic development on the spread of HIV infection and on health spending. In the second chapter, 'The effects of societal variables on urban rates of HIV infection in developing countries', Mead Over uses cross-country data to explore economic and demographic correlates of HIV infection rates among low- and high-risk urban residents. His statistical results show that cities with higher ratios of prime-age males to females or of soldiers to the general urban population have higher infection rates, especially among sex workers. After controlling for these and other indicators of the riskiness of sexual behaviour, he finds that lower income per capita and greater income or gender inequality are associated with higher rates of HIV infection. This paper supports an important conclusion of chapter 1 of *Confronting AIDS* concerning the relationship between development policy and the AIDS epidemic: some policies, such as those that reduce income and gender inequality, will help to reduce the epidemic; but others, such as those that result in greater internal and external migration, may inadvertently encourage the spread of HIV, unless accompanied by vigorous prevention programmes.

In the third chapter, 'Does structural adjustment cause AIDS?' Christine Jones discusses the hypothetical channels through which development policies might reduce or exacerbate the HIV/AIDS epidemic. Because governments must often reduce or reallocate spending as part of macroeconomic adjustment, an often-expressed concern is that health expenditure, and thus AIDS spending, may be reduced, with possible negative consequences for efforts to contain the epidemic. Jones conducts multivariate regression analysis across a number of adjusting and non-adjusting countries and finds no statistically significant effect of adjustment on government health spending, a finding consistent with other less rigorous studies. Of course, it still may be the case that in some specific countries policymakers have unwisely chosen to cut spending on HIV prevention in response to budget problems. *Confronting AIDS* argues that governments have a responsibility to guarantee the highest priority AIDS prevention and mitigation programmes (discussed above), even when economic adversity or adjustment force cutbacks elsewhere in the public budget.

In the fourth chapter, 'AIDS: The economic rationale for public intervention', Michael Kremer provides the economic argument for a government role in AIDS prevention even when government resources are extremely scarce. He reviews the market failures engendered by the AIDS epidemic – among them the negative externalities of risky behaviour, the insufficiency of incentives for the private production of public goods, and the asymmetry of information between sex or needle sharing partners – and shows why private solutions to the AIDS epidemic are likely to be inadequate.

Public health is often invoked to abrogate certain individual rights in the case of an epidemic, such as in the case of a quarantine. With HIV, however, this move is counterproductive. In chapter 5, 'International law and the rights of people living with HIV/AIDS', Hnin Hnin Pyne draws on work by the late Jonathan Mann – a crusader for human rights in the context of the AIDS epidemic – and his collaborator Daniel Tarantola (*AIDS in the World II*, New York, Oxford University Press, 1996). She reviews human rights covenants in relation to HIV infection and summarises the degree of protection afforded the HIV-infected in countries around the world. Pyne makes the case for the need to monitor and document human rights abuses against PLWHA. In calling for a closer collaboration between public health scientists and human rights advocates, the chapter supports the emphasis throughout *Confronting AIDS* on protecting the rights of the infected as a fundamental requirement of an effective government response.

HIV prevention policies and the socioeconomic determinants of infection

The second part of this volume includes six papers that served as background for chapters 2 and 3 of *Confronting AIDS*. They deal with the biological and behavioural determinants of HIV infection and with prevention strategies.

Virtually all studies in sub-Saharan Africa have found that adults with higher socioeconomic status – as measured by education, income, and occupation – are more likely to become infected with HIV than those with lower status. At the same time, there is evidence from other parts of the world that this relationship eventually reverses itself, as those with higher status are better able to avail themselves of prevention services. In chapter 6, 'Who is most likely to die of AIDS?' Martha Ainsworth and Innocent Semali compare the socioeconomic status of adults who died of AIDS and those who died of other causes in the Kagera region of Tanzania. They find that in the early 1990s it was still the case that women with more education were more likely to die of AIDS than women with less education, but for men this relationship seemed to be changing.

Socioeconomic status affects the probability of HIV infection through differences in sexual behaviour and condom use. Chapters 7 and 8 present results of multivariate regression analyses of the correlation among individual socioeconomic characteristics (age, gender, schooling, household assets, area of residence) and risky behaviour and condom use in more than a dozen developing countries. In chapter 7, 'The socioeconomic correlates of sexual behaviour', Deon Filmer compares the results for the determinants of having a 'non-regular' partner, early sexual initiation, and condom use with a non-regular partner across data sets from Demographic and Health Surveys (DHS) in nine countries from the early 1990s. In chapter 8, 'Socioeconomic determinants of sexual behaviour and condom use', Jean-Claude Deheneffe, Michel Caraël, and Amadou Noumbissi conduct a similar analysis in 12 countries or sites, using WHO/GPA data from 1989–91. These two chapters provide strong empirical evidence of the extraordinary heterogeneity in sexual behaviour within and across countries, with some individuals having a great many more sexual partners than others. In chapters 2 and 3 of *Confronting AIDS* this fact is key to explaining how HIV spreads and can be most efficiently prevented. These two studies also consistently find that men and women with more schooling are more likely to use condoms, a reason why the positive correlation between HIV infection and education in some countries is likely to reverse itself in the longer run.

The next two chapters are important reviews of the literature on the economics of commercial sex (chapter 9) and on HIV and injected drugs (chapter 10) in developing countries. In chapter 9, 'The economics of the commercial sex industry', Dennis A. Ahlburg and Eric R. Jensen examine the economic factors underlying both the demand for and supply of commercial sex with specific examples from developing countries. They also present a discussion, punctuated by available evidence, of the likely responses to various approaches to controlling commercial sex – from banning it at one extreme to regulating it at the other – and the likely impact of these measures on the spread of HIV. Kara S. Riehman, in chapter 10, 'Injecting drug use and AIDS in developing countries', reviews available evidence on the prevalence of injecting drug use in developing countries and the effectiveness of alternative policies to prevent HIV transmission among injecting drug users – both 'harm reduction' policies that reduce HIV transmission without affecting drug use and those policies that reduce the supply of and demand for injectable drugs. Both of these chapters conclude that measures to encourage safer behaviour among people engaging in activities likely to spread HIV have been proven effective. They also conclude that measures that raise the costs of risky behaviour through incarceration and prohibitions infringe on the rights of affected groups and are likely to accelerate the epidemic by reducing these groups' access to public health measures.

In the last chapter of this section, 'The effectiveness of HIV prevention strategies under alternative scenarios', chapter 11, Carina van Vliet and her colleagues use a microsimulation model (STDSIM) to show alternative courses of an HIV epidemic in hypothetical populations that differ only in their underlying sexual behaviour patterns. Their simulations, which are summarised in chapters 2 and 3 of *Confronting AIDS*, demonstrate the benefits of intervening early and the power of prevention among those with the riskiest behaviour relative to the whole population, irrespective of the underlying patterns of sexual behaviour in the population or the stage of the epidemic. The simulations also demonstrate that STD treatment will not be sufficient to reverse a severe HIV epidemic; increased condom use is key to reducing both HIV and other STDs.

The impact of AIDS on the health sector

The third part of this volume includes three papers that served as background for the first half of chapter 4 of *Confronting AIDS*. They concern the impact of AIDS on the health sector.

Chapter 12, 'Levels and determinants of expenditures on HIV/AIDS in five developing countries', is one of the first attempts to estimate public and private spending on AIDS in several developing countries using a roughly comparable methodology. Part A compares spending patterns across five developing countries – Côte d'Ivoire, Mexico, São Paulo state of Brazil, Tanzania, and Thailand. More detailed information on the methodology and on AIDS expenditure is provided for each of these country case studies in parts B through F. Donald S. Shepard and his colleagues find that per capita public and private expenditure on AIDS in these countries ranges from US$1.50 to US$9.00 per capita and rises with per capita income and AIDS incidence. The cost of treating an AIDS patient ranged from 0.4 to 3.0 times per capita GNP. Chapter 4 of *Confronting AIDS* argues that the treatment of AIDS patients should be subsidised at roughly the same rate as the treatment of patients with other similar diseases. In two of the countries – Côte d'Ivoire and Tanzania – the subsidy rate for AIDS treatment was roughly similar to that for treatment of other subsidised conditions. However, in São Paulo state (Brazil) and Thailand, AIDS patients got higher subsidies, and in Mexico much lower subsidies, compared with other patients.

In 1994 both Thailand and Brazil provided most AIDS patients with free AZT, the first widely distributed antiretroviral medication for AIDS patients. Since AZT was very expensive, this distribution probably accounted for the higher subsidy rates for AIDS patients observed in these two countries by Shepard and colleagues. In chapter 13, 'Policy options for antiretroviral treatment', Nicholas Prescott evaluates the impact and affordability of eight different options for antiretroviral therapy for adult HIV/AIDS patients and two options for reducing mother-to-child transmission in Thailand. He finds that the options for preventing mother-to-child transmission produce nearly 20 times more 'quality-adjusted life years' per million baht expended than do the adult antiretroviral regimes. Since this paper was written, the price of AZT has dropped further and lower-dose treatment regimens for preventing mother-to-child transmission have been found effective, a development that has improved the cost-effectiveness of this intervention. At the same time, more effective adult antiretroviral therapy has been developed but at even greater cost. Thus, it is likely still the case, as presented in chapter 4 of *Confronting AIDS,* that antiretroviral therapy for reducing mother-to-child transmission is more cost-effective per 'quality-adjusted life year' than is ART for adults.

In chapter 14, 'Safety of blood and blood products', Lieve Fransen reviews the impact of the AIDS epidemic on the safety of national blood banks in developing countries, the contribution of safer blood to stemming the AIDS epidemic, and the costs and benefits of enhanced blood safety in several African countries. The role of blood transfusion safety in halting the spread of HIV will vary by country. In most cases safer transfusion services will prevent some infections but will not be efficient in stopping an epidemic based on sexual HIV transmission because transfusion recipients on average do not have many sexual partners. However, providing safe blood is essential for preserving the quality and reputation of the health service. Thus, as is maintained in chapter 4 of *Confronting AIDS*, setting up a safe blood system is a proper candidate for public subsidy in countries where it is unlikely that such a system would otherwise evolve.

The impact of AIDS on households

The fourth and final section of the volume assembles three studies of the impact of adult deaths on households in three countries – Uganda (chapter 15), Côte d'Ivoire (chapter 16), and Thailand (chapter 17). These papers provide evidence reviewed in the second half of chapter 4 in *Confronting AIDS* that the poorest households suffer particularly hard from the impact of an adult death. Further, they document the ways in which households cope with that impact.

In chapter 15, 'The economic impact of adult mortality on households in Rakai district, Uganda', Rekha Menon and her colleagues highlight the role of changes in household composition and drawing down assets (durable goods) to smooth consumption following an adult death. While almost all households with an adult death got smaller, overall household size and dependency ratio after the adult death were no different than in households that did not experience a death. The study also observed a great deal of 'turnover' in household composition over the observation period in all households. And while the likelihood of durable goods ownership rose over time among households without an adult death, it declined in households with a death.

Nathalie Béchu, in 'The impact of AIDS on the economy of families in Côte d'Ivoire', chapter 16, finds that household consumption per capita drops before and partly recovers after a prime-aged adult death. Households squeeze discretionary expenditure while trying to protect basic needs. She also finds, contrary to intuition, that as of the early 1990s when the data were collected, expenditure on medical care declined as the AIDS patient's condition worsened.

In the final chapter, 'The impact of AIDS on household composition and consumption in Thailand', Wattana Janjaroen finds that changing household composition is not as common in response to an adult death in Thailand as it is in the African examples. The death of a prime-aged woman has a larger impact on reducing consumption expenditure, but households whose heads have more education are better able to absorb the economic shock of a prime-aged death on consumption.

The papers in this volume fill important gaps in the literature on the economics of the AIDS epidemic in developing countries, but significant gaps remain.

- Studies that measure and compare the cost-effectiveness of alternative prevention interventions (both medical and behavioural) in a given setting are scarce and typically ignore the fact that some interventions prevent larger numbers of secondary infections. In particular, carefully conducted, randomised studies of the effectiveness of behavioural interventions in different settings are critically needed.
- Patterns of expenditure on AIDS prevention and treatment across countries and their relation to country policies have not been documented.
- There are very few studies of the political economy of AIDS policy development or the impact of public AIDS programmes. Internationally comparable indicators of country AIDS policy are in their infancy.
- Accurate assessment of the macroeconomic impact of the AIDS epidemic rests heavily on information on the impact of HIV infection on individual and household savings and investment behavior. Yet rigorous studies of this type are exceedingly rare.

- Little is known of the impact of AIDS mortality on the profits or productivity of firms, including the impact on attrition, recruitment, and training of employees of different levels of skill, as well as the impact on labor productivity and employer-sponsored health care.

We hope that future books will be written on the economics of the AIDS epidemic that will bring to policymakers this crucial information as the governments of developing countries continue to confront the AIDS epidemic.

Part I

AIDS and Development

1

The future demographic impact of AIDS: What do we know?

by John Stover

Section One: Introduction

Ever since AIDS was recognised as a critical global health problem that would lead to increased adult and child mortality there have been debates about the demographic impact of AIDS. There has been speculation that the impact of AIDS might be so large as to cause negative population growth rates in some countries. Much of this debate centred on Africa, where HIV prevalence rates are the highest. Some researchers concluded that:

'… in the worst-afflicted areas AIDS is likely to change population growth rates from positive to negative values in a few decades'. (Anderson et al 1991)

Others found that:

'… population growth rates are unlikely to turn negative in Central Africa. More likely, the population growth rates in Central and East Africa will not drop below half their current values'. (Bongaarts 1990)

A review of the different approaches to estimating the demographic impact of AIDS conducted in 1993 (Stover 1993) found that most researchers used similar methodologies. The opposite conclusions were due to different views about future levels of HIV prevalence in Africa. Those who felt that prevalence would continue to increase to very high levels found severe demographic impacts while those projecting more moderate prevalence levels in the future found that the demographic impact would be significant but would not lead to negative population growth in the African context.

In 1993 and 1994 three major institutions released country-specific population projections that, for the first time, included the impact of AIDS. None of these studies projected negative population growth in Africa as a result of AIDS. However, other results were quite different, especially for certain countries.

The United Nations included the impact of AIDS in its 1992 and 1994 editions of *World Population Prospects* (UN 1993, 1995, 1996). In the 1994 revision the UN reported:

- AIDS would reduce the projected population of 15 countries in sub-Saharan Africa by about 4 per cent (12 million people) by 2005.
- The additional number of deaths due to AIDS would reach 9.7 million by 2005.
- The most severely affected countries, Zimbabwe and Zambia, would have 7 per cent fewer people in 2005 than they would have had without AIDS.
- The average annual population growth rate in Zambia for the 2000–2005 period would be reduced from 2.4 per cent without AIDS to 0.5 per cent with AIDS.
- Life expectancy for Zambia and Zimbabwe would be reduced by 22 per cent by 2000–2005, from 59.7 to 46.5 years for Zambia and from 65.9 to 51.1 years for Zimbabwe.

The US Bureau of the Census included the impact of AIDS in its 1994 and 1996 sets of population projections for the countries of the world (McDevitt 1996; Jamison and Hobbs 1994). Its projections showed a much more dramatic impact of AIDS on population growth than those of the United Nations:

- By 2010, 66 million fewer people are expected in the 23 countries with the most severe epidemics.
- Life expectancy in Botswana would be reduced by 50 per cent (from 66 to 33). For all 23 severely affected countries, life expectancy would be 20 per cent lower in 2010 than it would be without AIDS.
- Population growth rates would remain positive in all countries but would be reduced significantly due to AIDS. For the severely affected countries, the rate of natural increase in 2010 is projected to be 1.6 per cent per year, compared to 2.2 per cent without AIDS.

The World Bank included the impact of AIDS in its 1994–95 report (Bos et al 1994). Its projections show a smaller impact of AIDS than either the Census Bureau or the United Nations:

- The population of sub-Saharan Africa would be reduced by about 9 million people by 2005 from what it would have been without AIDS.
- Life expectancy in Uganda would be reduced by at most 15 per cent (from 52 to 44 years) by 2005.
- Annual population growth rates for all of sub-Saharan Africa would decline by at most 0.15 per cent.

Why are the results so different? At first glance it may seem that the differences are due to different reporting dates and countries. For example, one institution reports figures for 2005 while another reports for 2010. However, on closer inspection, it becomes clear that large differences exist even when projections are compared for the same year and the same countries.

The purpose of this paper is to examine the reasons for the differences among the various projections and to explain the factors contributing to them.

Section Two: Different approaches to incorporating AIDS into demographic projections

2.1 The United Nations approach

The Population Division of the Department for Economic and Social Information and Policy Analysis of the United Nations Secretariat prepares the official population projections of the UN every two years. The 1992 revision was the first to incorporate AIDS (UN 1993). The impact of AIDS was included for all countries with an estimated adult HIV prevalence rate of more than 1 per cent. Estimates of HIV prevalence were provided by the Global Programme on AIDS (GPA) of the World Health Organisation. As a result, AIDS was incorporated into the projections for 15 countries, all in sub-Saharan Africa: Benin, Burkina Faso, Burundi, Central African Republic (CAR), Congo, Côte d'Ivoire, Kenya, Malawi, Mozambique, Rwanda, United Republic of Tanzania, Uganda, Zaire, Zambia, and Zimbabwe. For the 1994 revision (UN 1995) the projections for Thailand also included the impact of AIDS.

The UN population projections are made using a standard cohort component projection model developed by the UN called ABACUS. The AIDS projections were prepared using the GPA's EpiModel (Chin and Lwanga 1991) and then added to ABACUS through modified death rates (UN 1994). EpiModel projects the past and future course of an AIDS epidemic based on three key assumptions:

- the year in which HIV infection first became widespread
- the number of people alive with HIV infection in the current year
- the shape of the infection curve.

The model allows the user to select a curve type to describe cumulative HIV infections over time.

The UN projections assume a gamma curve (a type of S-shaped curve). A gamma curve is fitted to two points: zero infections the year before HIV infection became well established in a core group and the current estimate of infections. The user decides where on the gamma curve the current year lies. If the user decides that the epidemic is still in its early stages, then the point representing the current year would be placed in the early part of the S-curve, leaving the most rapid increase in infections to occur in the future. If the user decides that HIV incidence is currently at its peak, then the current year estimate would be placed right in the middle of the S-curve. Similarly, if it is assumed that the epidemic has reached the endemic stage, then the current year estimate would be placed near the top of the S-curve.

Thus, the assumption about the current stage of the epidemic largely determines the future projection. The UN projections assume that the peak incidence rate, the middle of the gamma curve, is reached 12 years after the beginning of the epidemic. EpiModel also requires an assumption about adult and child incubation periods. The incubation period is the number of years from infection with HIV until the development of AIDS. This is usually described as the percentage of people newly infected with HIV that develop AIDS in each subsequent year.

Once these assumptions are made, the EpiModel projection process follows these steps:

1. Read the number of adults alive with HIV infection from the gamma curve for a particular year.
2. Calculate the number of new adult HIV infections required to reach the total number alive with HIV infection in that year (by subtracting the number of infections in the previous year from the number of infections in the current year and adding the number of AIDS deaths during the past year).
3. Use the assumption about the incubation period to determine when people with a new HIV infection will develop AIDS and die.
4. Calculate the number of child deaths from AIDS based on assumptions about the crude birth rate, the perinatal transmission rate of HIV, and the incubation period for child infections.

From these steps, it can be seen that the assumptions about the average length of the incubation period and the length of the period from AIDS until death are also quite important. If the incubation period is assumed to be relatively short, then people infected with HIV will die soon, thus requiring a higher rate of new HIV infections to achieve the assumed number of people alive with HIV infection at any given time. A longer incubation period means that people infected with HIV live longer, thus requiring fewer new infections to achieve the same number of total HIV infections at any given time.

EpiModel is used to determine the number of AIDS-related deaths by year. These deaths are then distributed by age and sex according a typical pattern of AIDS deaths. For sub-Saharan African countries this pattern typically shows roughly the same number of male and female deaths, with the largest number of deaths in the age group 35 to 45 for males and about five years younger for females. This pattern of AIDS deaths is then added to the deaths calculated from all other causes by the ABACUS model to produce the final population projections.

From this brief description, it is apparent that five assumptions are key to estimating the demographic impact of AIDS:

1. the year that the epidemic began
2. the peak rate of HIV incidence will occur 12 years after HIV infection becomes widespread
3. the number of HIV infections in the current year
4. the duration of the incubation period
5. the perinatal transmission rate.

In East and Central Africa, HIV infection is generally assumed to have become widespread in the late 1970s and early 1980s. Thus 1980 is a typical value for the first year of the epidemic. This implies that HIV incidence would reach a peak for most countries in the early 1990s.

The number of HIV infections in the most recent year was taken from the

GPA estimates. These estimates are based on the results of surveys of various population groups that test blood to determine HIV infection. Most of these surveys are one-time studies undertaken by different research groups. In some cases, sentinel surveillance systems provide annual estimates of HIV infection among certain population groups.

The UN estimates use the assumption that the average length of time from HIV infection until AIDS is about 10 years. In addition, the perinatal transmission rate is assumed to be 30 per cent.

2.2 The World Bank approach

Until 1994, the World Bank prepared population projections for all the countries in the world for use in World Bank projects and analyses. The most recent projections (Bos et al 1994) included the impact of AIDS. The World Bank approach differs from the UN approach, primarily in the method it uses for projecting the number of new HIV infections. These projections are based on a model prepared by Rodolfo Bulatao (Bos and Bulatao 1992). The Bulatao model simulates the spread of HIV through a population based on the behaviour and characteristics of different population subgroups and assumptions about key epidemiological parameters, such as the probability of transmitting the virus in a single unprotected contact.

The model considers HIV transmission through heterosexual and homosexual contact, blood transfusions, infected needles, and perinatal transmission. This model was used to simulate a variety of epidemics that included a range of typical values for starting HIV prevalence in 1990 and included various levels of interventions as well. Then, regression analysis was used with the results to develop a set of equations to project future levels of HIV prevalence based on the 1990 level. A similar set of equations was developed to project life expectancy at age 10 as a function of adult HIV prevalence. The demographic projections involve the following steps:

1. Levels and patterns of mortality in the absence of AIDS are projected and the most appropriate Coale-Demeny life table is selected.
2. HIV prevalence in future years is projected on the basis of estimated prevalence in 1990 and the assumed starting year of the epidemic. Incidence is assumed to decline by 50 per cent each year after 2005.
3. The number of years of life expectancy lost due to AIDS is projected using the regression equations relating adult prevalence to life expectancy.
4. The number of years of life expectancy lost is subtracted from the no-AIDS trends until 2020–25. After that period, AIDS mortality is assumed to decline to zero by 2050.

The 1994–95 projections were based on estimates of adult HIV prevalence by country prepared by the GPA (Chin 1991). The projections assume an incubation period that averages 10 years and a perinatal transmission rate of 30 per cent.

2.3 The Census Bureau approach

The Census Bureau prepares demographic projections for all the countries of the world every two years. The most recent projections, prepared in 1996, include the impact of AIDS (McDevitt 1996; Jamison and Hobbs 1994; Way and Stanecki 1994). Like the UN and World Bank projections, the Census Bureau used an external AIDS model to determine the number of AIDS deaths and then incorporated these estimates in its urban/rural demographic projection model. The Census Bureau used the iwgAIDS model, a complex simulation model of the spread of HIV through a population as a result of the behaviour of various population subgroups (Stanley et al 1991). This model was used to simulate three different African epidemics:

- In the low scenario, HIV prevalence among adults aged 15–49 increases slowly, reaching only about 5 per cent after 45 years.
- In the medium scenario, prevalence increases to about 17 per cent after 35 years and then stabilises.
- In the high scenario, prevalence increases to about 37 per cent after 45 years.

In order to project HIV prevalence for an individual country, estimates of prevalence for two historical years were prepared. The rate of increase in prevalence between these two years was compared to the rates of increase in the three simulated scenarios for the corresponding stage of the epidemic. This comparison was used to interpolate a new prevalence curve from the simulated scenarios that matched the historical experience. This interpolated curve provided the prevalence projection. Prevalence is assumed to peak in 2010, with no new infections occurring after that date. A similar interpolation procedure was used to determine age- and sex-specific mortality rates.

The scenarios developed using the iwgAIDS model assumed an incubation period with an average duration of 7.5 years and a perinatal transmission rate of 39 per cent. Initial-year HIV prevalence assumptions were based on examination of the AIDS database (US Bureau of the Census 1992).

Population projections incorporating AIDS were made for all countries with HIV prevalence above 5 per cent for adults aged 15–49 in urban areas. This criterion selected 19 African countries (Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo, Côte d'Ivoire, Ethiopia, Kenya, Lesotho, Malawi, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zaire, Zambia, Zimbabwe), Guyana, and Haiti. Brazil and Thailand were also included for other reasons.

2.4 The Population Council approach

In 1995 John Bongaarts of the Population Council prepared a set of projections showing the demographic impact of AIDS by geographic region (Bongaarts 1996). These projections are not country-specific, and they present results for all the regions of the world, not just Africa. They are included in this paper because they produce similar results to those prepared by the UN and World Bank and can be used to illustrate the effects of different assumptions on the future projections more easily than the projections involving multiple countries.

Bongaarts starts with the GPA estimates of adult HIV incidence rates from 1980 to 1995 by major region of the world. He then makes several assumptions about the future course of incidence. In the medium projection, he assumes that incidence remains at the 1995 level through 2005.

Once HIV incidence is known, the Bongaarts model calculates new AIDS cases using an assumed incubation period with a median length of 9.5 years. The median time from AIDS to death is assumed to be 0.5 years. Child mortality due to AIDS is calculated from the crude birth rate and perinatal transmission rate, which is assumed to be 30 per cent.

Section Three: Comparison of projection results

It should be noted that all four sets of projections agree on one key point:

- AIDS will not cause negative population growth in any country in sub-Saharan Africa.

The following comparisons use the 1994 projections from each organisation unless stated otherwise.

3.1 Total population size without AIDS

Table 1 shows the projections of total population size from the Census Bureau, the United Nations, and the World Bank from 1990 to 2025 in the absence of AIDS. There is good agreement, although not perfect, on the estimate of population size in 1990. Even by 2010, the three projections show reasonably close agreement for most countries.

The projections do diverge more by 2025, largely due to differences in assumed rates of fertility decline. For the entire set of 13 countries the UN and Census Bureau differ by only 4 per cent by 2025. Even the World Bank projections are only 12 per cent lower than the Census Bureau's projections in 2025.

Table 1. Comparison of population projections with no AIDS (millions)

Location	Source	1990	2010	2025	% difference from Census Bureau in 2025
Burkina Faso	Census Bureau	9.1	17.2	26.2	
	UN	9.0	16.3	24.7	-5.7
	World Bank	9.0	16.1	23.2	-11.5
Burundi	Census Bureau	5.6	10.5	15.9	
	UN	5.5	10.1	15.0	-5.7
	World Bank	5.4	10.2	15.3	-3.8

(Table continues on next page.)

Table 1 *(continued)*

Location	Source	1990	2010	2025	% difference from Census Bureau in 2025
CAR	Census Bureau	2.9	4.7	6.7	
	UN	3.0	5.4	8.1	20.9
	World Bank	3.0	5.0	6.7	0.0
Congo	Census Bureau	2.2	3.8	5.2	
	UN	2.2	4.2	6.5	25.0
	World Bank	2.3	4.4	6.7	28.8
Côte d'Ivoire	Census Bureau	12.5	25.3	37.9	
	UN	12.0	25.5	42.6	12.4
	World Bank	11.9	23.4	33.8	-10.8
Kenya	Census Bureau	24.3	45.2	61.9	
	UN	23.6	46.0	68.1	10.0
	World Bank	24.2	46.8	67.2	8.6
Malawi	Census Bureau	9.4	16.5	25.8	
	UN	9.6	18.3	28.8	11.6
	World Bank	8.4	14.7	20.2	-21.7
Rwanda	Census Bureau	7.5	15.4	24.8	
	UN	7.1	14.6	23.4	-5.6
	World Bank	7.0	11.8	15.6	-37.1
Tanzania	Census Bureau	25.3	47.5	73.0	
	UN	26.1	52.3	83.1	13.8
	World Bank	24.5	45.0	64.3	-11.9
Uganda	Census Bureau	18.0	36.1	57.7	
	UN	17.8	35.2	54.7	-5.2
	World Bank	16.3	32.8	51.0	-11.6
Zaire	Census Bureau	38.1	74.4	117.4	
	UN	37.5	73.9	117.2	-0.2
	World Bank	37.3	67.4	94.2	-19.8
Zambia	Census Bureau	8.3	16.8	26.8	
	UN	8.2	15.9	24.4	-9.0
	World Bank	8.1	15.2	21.7	-19.0
Zimbabwe	Census Bureau	10.4	17.5	22.8	
	UN	10.0	18.0	25.4	11.4
	World Bank	9.8	15.7	19.6	-14.0
Total	Census Bureau	173.6	330.9	502.1	
	UN	171.6	335.7	522.0	4.0
	World Bank	167.2	308.5	439.5	-12.5

Source: Unpublished tables provided by the United Nations, World Bank, and US Bureau of the Census.

3.2 Total population size including AIDS

Table 2 presents a comparison of the population projections including the impact of AIDS. It is interesting to note that, in the aggregate, the agreement is good. The World Bank and Census Bureau differ by only 1 per cent and the UN is only 16 per cent higher by 2025. However, the aggregate figures mask some large differences at the country level. There are particularly large differences for the Congo, Kenya, Zimbabwe, and Central African Republic. Of course, the interpretation of these differences is complicated by the fact that they are the combined result of differences in demographic and AIDS assumptions.

For the 1996 projections, there are changes for some countries, but the results are quite similar in the aggregate. For all the countries listed in table 2, the UN projections for 2020 are 16 per cent higher than those from the Census Bureau.

Table 2. Comparison of population projections with AIDS (millions)

Location	Source	1990	2010	2025	% difference from Census Bureau in 2025
Burkina Faso	Census Bureau	9.0	14.5	20.9	
	UN	9.0	15.5	22.6	8.1
	World Bank	9.0	15.8	22.6	8.1
Burundi	Census Bureau	5.6	8.4	12.4	
	UN	5.5	9.3	13.4	8.1
	World Bank	5.4	9.7	14.0	12.9
CAR	Census Bureau	2.9	3.9	5.2	
	UN	3.0	4.9	7.0	34.6
	World Bank	3.0	4.8	6.2	19.2
Congo	Census Bureau	2.2	3.2	4.2	
	UN	2.2	3.9	5.8	38.1
	World Bank	2.3	4.3	6.4	52.4
Côte d'Ivoire	Census Bureau	12.4	22.9	33.8	
	UN	12.0	23.7	37.9	12.1
	World Bank	11.9	22.5	31.9	-5.6
Kenya	Census Bureau	24.2	38.0	49.1	
	UN	23.6	44.4	63.8	29.9
	World Bank	24.2	45.8	64.7	31.8
Malawi	Census Bureau	9.3	13.2	20.0	
	UN	9.6	16.5	24.9	24.5
	World Bank	8.4	14.0	18.7	-6.5
Rwanda	Census Bureau	7.4	11.8	17.6	
	UN	7.0	13.3	20.6	17.0
	World Bank	7.0	11.2	14.4	-18.2

(Table continues on next page.)

Table 2 *(continued)*

Location	Source	1990	2010	2025	% difference from Census Bureau in 2025
Tanzania	Census Bureau	25.2	38.7	56.3	
	UN	26.0	48.4	74.2	31.8
	World Bank	24.5	42.9	59.3	5.3
Uganda	Census Bureau	17.7	27.0	40.1	
	UN	17.6	30.7	45.9	14.5
	World Bank	16.3	29.5	41.9	4.5
Zaire	Census Bureau	37.9	69.1	107.6	
	UN	37.4	68.6	104.5	-2.9
	World Bank	37.3	65.4	89.2	-17.1
Zambia	Census Bureau	8.2	12.6	18.5	
	UN	8.1	13.9	21.0	13.5
	World Bank	8.1	13.6	18.2	-1.6
Zimbabwe	Census Bureau	10.2	13.0	16.0	
	UN	9.9	16.8	22.9	43.1
	World Bank	9.8	14.8	18.1	13.1
Total	Census Bureau	172.2	276.3	401.7	
	UN	170.9	309.9	464.5	15.6
	World Bank	167.2	294.3	405.6	1.0

Source: McDevitt 1996; Bos et al 1994; UN 1995.

3.3 Net effect of AIDS on population size

Table 3 presents the net change in the population projection as a result of AIDS. This change will result from AIDS deaths to adults and children as well as a reduced number of births due to a smaller reproductive population. None of the projections assumed any connection between HIV prevalence and fertility rates, so the only effect on births is through a reduction in the number of reproductive-age women.

Table 3 shows very large differences in both 2010 and 2025 between the Census Bureau projections and the UN and World Bank projections. With only a few exceptions, the differences between the Census Bureau projections and those by the World Bank and UN are larger than the differences between the UN and World Bank. Furthermore, there is a consistent pattern. The Census Bureau projection shows a much larger effect of AIDS on population size than either the UN or World Bank. In fact, the Census Bureau projections show an impact two to three times larger.

Table 3. Comparison of net effect of AIDS on total population (millions)

					% difference from Census Bureau in:	
Location	**Source**	**1990**	**2010**	**2025**	**2010**	**2025**
Burkina Faso	Census Bureau	0.1	2.7	5.3		
	UN	0.0	0.8	2.1	-70.4	-60.4
	World Bank	0.0	0.3	0.6	-62.5	-88.7
Burundi	Census Bureau	0.0	2.1	3.5		
	UN	0.0	0.8	1.6	-61.9	-54.3
	World Bank	0.0	0.5	1.3	-37.5	-62.9
CAR	Census Bureau	0.0	0.8	1.5		
	UN	0.0	0.5	1.1	-37.5	-26.7
	World Bank	0.0	0.2	0.5	-60.0	-66.7
Congo	Census Bureau	0.0	0.6	1.0		
	UN	0.0	0.3	0.7	-50.0	-30.0
	World Bank	0.0	0.1	0.3	-66.7	-70.0
Côte d'Ivoire	Census Bureau	0.1	2.4	4.1		
	UN	0.0	1.8	4.7	-25.0	14.6
	World Bank	0.0	0.9	1.9	-50.0	-53.7
Kenya	Census Bureau	0.1	7.2	12.8		
	UN	0.0	1.6	4.3	-77.8	-66.4
	World Bank	0.0	1.0	2.5	-37.5	-80.5
Malawi	Census Bureau	0.1	3.3	5.8		
	UN	0.0	1.8	3.9	-45.5	-32.8
	World Bank	0.0	0.7	1.5	-61.1	-74.1
Rwanda	Census Bureau	0.1	3.6	7.2		
	UN	0.1	1.3	2.8	-63.9	-61.1
	World Bank	0.0	0.6	1.2	-53.8	-83.3
Tanzania	Census Bureau	0.1	8.8	16.7		
	UN	0.1	3.9	8.9	-55.7	-46.7
	World Bank	0.0	2.0	5.0	-48.7	-70.1
Uganda	Census Bureau	0.3	9.1	17.6		
	UN	0.2	4.5	8.8	-50.5	-50.0
	World Bank	0.0	3.3	9.1	-26.7	-48.3
Zaire	Census Bureau	0.2	5.3	9.8		
	UN	0.1	5.3	12.7	0.0	29.6
	World Bank	0.0	2.0	5.0	-62.3	-49.0
Zambia	Census Bureau	0.1	4.2	8.3		
	UN	0.1	2.0	3.4	-52.4	-59.0
	World Bank	0.0	1.6	3.5	-20.0	-57.8

(Table continues on next page.)

Table 3 *(continued)*

Location	Source	1990	2010	2025	% difference from Census Bureau in: 2010	% difference from Census Bureau in: 2025
Zimbabwe	Census Bureau	0.2	4.5	6.8		
	UN	0.1	1.2	2.5	-73.3	-63.2
	World Bank	0.0	0.9	1.5	-25.0	-77.9
Total	Census Bureau	1.4	54.6	100.4		
	UN	0.7	25.8	57.5	-52.7	-42.7
	World Bank	0.0	14.1	33.9	-66.2	-66.2

Source: Author's calculations.

3.4 Number of AIDS deaths

The direct effect of AIDS is best indicated by the total number of deaths due to AIDS. The second column of table 4 shows the average annual number of AIDS deaths for sub-Saharan Africa projected by all four organisations.

These projections are not strictly comparable for several reasons. First, the Population Council figures are for the entire region, while the figures for the other three organisations represent the deaths in the 13 high-prevalence countries of Africa. Thus, the Population Council figures should be reduced by 5 to 10 per cent to remove these additional countries. Second, the World Bank and Census Bureau projections include the fact that some HIV-infected people will die from other causes before dying from AIDS.

The UN and Population Council projections do not include this adjustment. To correct for this factor, the UN and Population Council should be reduced by about another 10 per cent. The adjusted figures are shown in the last column in table 4. This table illustrates clearly that the Census Bureau figures are considerably higher than the other three projections.

3.5 Annual population growth rates

The differences in annual population growth rates parallel the differences in

Table 4. Annual number of AIDS deaths during 2000–2005 (millions)

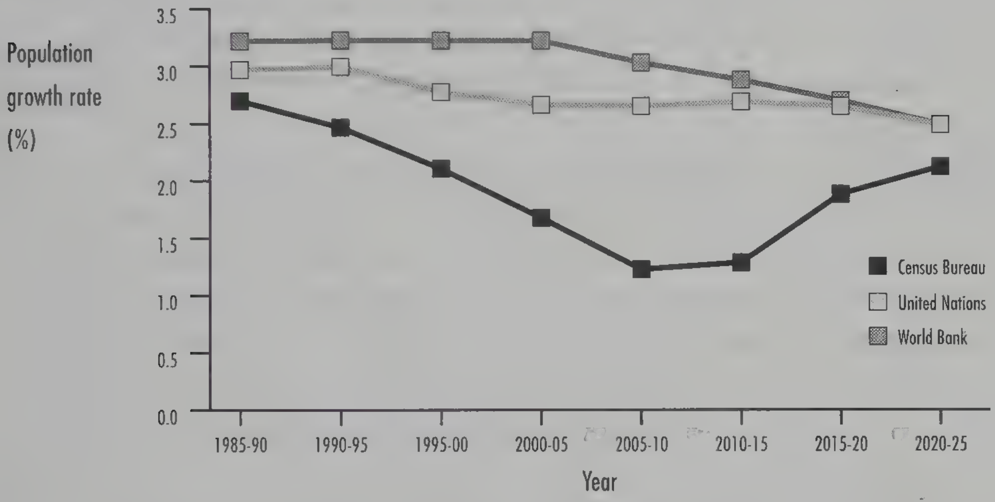
Source	Annual number of AIDS deaths	Adjusted number of AIDS deaths
Census Bureau	2.16	2.16
United Nations	1.07	0.96
World Bank	0.67	0.67
Population Council	1.01	0.85

Source: Unpublished tables provided by the UN, World Bank, US Bureau of the Census, and Bongaarts 1996.

total population size. None of the organisations project that the population growth rate of Africa will drop below 2 per cent per year during the next 20 years, even with the huge increase in AIDS deaths.

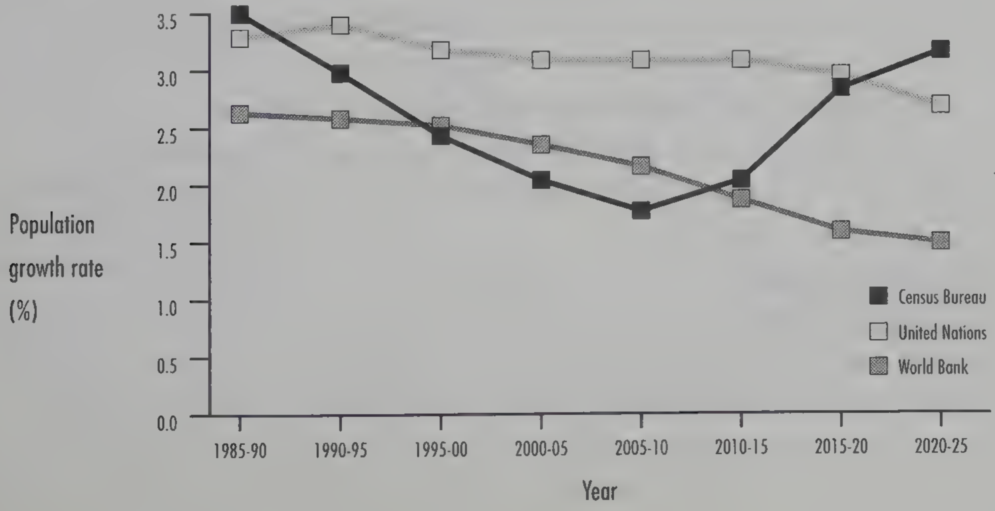
It is also interesting to look at some country-specific projections. Figure 1 shows the projections of annual growth rates for the Congo. It shows a typical pattern: the three projections start at about the same point in 1985–90, the Census Bureau projections show a larger decline through 2005, and all three projections converge again at the end of the projection period when AIDS is assumed to have disappeared as a major mortality factor.

Figure 1. Annual population growth rates for the Congo



A somewhat different pattern is shown in figure 2 for Rwanda. The UN and Census Bureau projections follow the typical pattern described for the Congo. However, the World Bank projection shows a steady decline in the growth rate and ends in 2025 much lower than the UN and Census Bureau

Figure 2. Annual population growth rates for Rwanda



projections. In this case the difference is due to assumptions about the total fertility rate. The World Bank projects fertility in Rwanda to decline to about 2.5 by 2025, whereas the Census Bureau sees it dropping to only 5 by 2020 and the UN expects it to drop to 2.9 by 2025.

3.6 Dependency ratio

Another common measure of demographic change is the dependency ratio. The dependency ratio is defined as the number of the dependent people in the population (usually the population below the age of 15 and over the age of 64) per 100 adults of productive age (usually 15–64). The UN projections show the dependency ratio for all 15 African countries decreasing from 101.2 in 1995 to 96.1 in 2005 with AIDS and from 98.8 in 1995 to 94.9 in 2005 without AIDS. The difference in 2005 is just 1.2 per cent. The Census Bureau projections show the dependency ratio for sub-Saharan Africa decreasing from 101.2 in 1994 to 100.4 by 2000.

It might seem that the dependency ratio should increase due to AIDS because of the increased number of deaths to young adults. However, in the African context, AIDS also leads to an increase in the number of child deaths. These two factors tend roughly to balance each other, with the result that the dependency ratio does not change dramatically in the presence of an AIDS epidemic. Early in the epidemic the number of adults dying from AIDS is small in comparison to the number infected because of the long incubation period. (Adult deaths are roughly equivalent to the number of infections seven to 10 years earlier.) However, infected adults give birth to infected babies, who have a much shorter incubation period, so that child deaths are more closely related to the current HIV prevalence. Thus, even though only about 35 per cent of babies born to infected mothers are themselves infected, the number of child deaths roughly balances the number of adult deaths. As the epidemic matures and adult prevalence stabilises, the number of adult deaths should 'catch up'. However, by this time the number of adults has also been reduced by fewer children reaching adult status (since many have already died from AIDS). The result is that the dependency ratio does worsen slightly as a result of AIDS but the change is minor.

This does not mean that the dependency situation is not serious. An AIDS epidemic does create many orphans, for example. However, the traditional dependency ratio is not a good measure of the dependency burden created by AIDS.

Section Four: Reasons for differences

There are a number of factors that influence the projection of AIDS' impact, all of which contribute to some degree to the differences between the four different projections discussed here:

- adult HIV prevalence in the base year
- projection of future levels of adult HIV prevalence

- length of the incubation period for adults and children
- perinatal transmission rate
- methodology for incorporating AIDS deaths into demographic projection
- length of time from AIDS to death
- age and sex distribution of AIDS deaths
- start year of the epidemic.

4.1 Base-year prevalence

The United Nations, World Bank, and Population Council all used the GPA estimates of the base-year HIV prevalence. The Census Bureau used its own estimates, based on survey results in its database. In most cases, the surveys judged to be the most reliable and representative were identified for each country and used to estimate urban HIV prevalence. For some countries good surveys of rural prevalence are available, but for most, evidence of the extent of rural infection is sparse.

However, a large percentage of the population in most African countries lives in rural areas. Therefore, the selection of an appropriate figure for rural prevalence is key to the national estimate. The Census Bureau estimated that rural prevalence ranged from as much as 70 per cent of urban prevalence in Zimbabwe to as little as 20 per cent in Kenya. In most cases urban prevalence was assumed to be two to three times as high as rural prevalence.

The Census Bureau prevalence estimates refer to the adult population between the ages of 15 and 49 while the other organisations define adult prevalence to refer to all adults over the age of 15. This difference has the effect of increasing the Census Bureau estimates by about 15 per cent compared to the UN, World Bank, and Population Council.

The estimates of HIV prevalence provided to the UN and World Bank by the GPA were based on the same information in the Census Bureau database, supplemented with unpublished data made available to the GPA. They were never published and have not been released publicly. However, it is clear that they are considerably lower than the Census Bureau estimates. The GPA estimate of prevalence in all of sub-Saharan Africa was about 1.8 per cent. The Census Bureau estimates indicate a regional prevalence of about 3 per cent. The 1992 projections by the UN included special tables for countries with estimated HIV prevalence above 5 per cent: Malawi, Rwanda, Uganda, and Zambia. According to the Census Bureau, seven countries would have met this criteria (including Burundi, Tanzania, and Zimbabwe).

Both the Census Bureau and the United Nations have prepared new projections for 1996 and have updated their estimates of current HIV prevalence. They show quite clearly that the Census Bureau estimates are higher for most countries than those supplied by the GPA to the United Nations and World Bank.

Why are the Census Bureau estimates and those of the GPA so different? Large variations in country-specific estimates are not surprising. No country in

Africa has a recent national HIV survey. Therefore, anyone making an estimate of national prevalence must examine the surveys available for particular geographic areas and among different population groups. Each survey must be evaluated for quality and representativeness. It is not surprising that different individuals would produce different estimates using the same database. Since most surveys have been conducted in urban areas, the estimate of rural prevalence adds a large degree of variation. However, it is not clear why the GPA estimates are consistently lower than those of the Census Bureau. The answer may be simply that the GPA analysts adopted a more conservative approach and tended to pick lower estimates, while the Census Bureau analysts tended toward higher estimates when the evidence was not clear.

4.2 Future levels of adult HIV prevalence

Three different approaches to projecting future levels of prevalence have been used. The UN assumes that incidence peaks 12 years after the start of the epidemic. The gamma curve in EpiModel is used to project future incidence. Therefore, most UN projections are based on declining incidence after about 1995. Furthermore, it is assumed that there are no new infections after 2005.

Bongaarts follows the GPA assumption that incidence peaked around 1990 for all of Africa at about 3.5 new cases per 1,000 adults. He assumes that it declines somewhat to 1995 and then remains constant at about 3 per 1,000. The result is that adult prevalence increases from about 1.8 per cent in 1990 to 3 per cent by 2005.

The Census Bureau uses three different scenarios based on the iwgAIDS simulation model to provide patterns of future prevalence. Individual country projections are made by fitting past prevalence points to these patterns. The result is that prevalence for the 13 countries in Africa doubles from about 8 per cent in 1990 to 16 per cent by 2005. Prevalence is assumed to peak in all countries in 2010 with no new HIV infections occurring after that point. Thus, prevalence gradually declines after 2010 in all countries.

The World Bank uses a series of regression equations developed from the simulation model to project future HIV prevalence. These equations project HIV prevalence in any future year as a function of prevalence in 1990, the square of prevalence in 1990, and the start year of the epidemic. As a result of the form of the equations, prevalence peaks in 2005 and then declines slowly.

4.3 Length of the incubation period

The UN, World Bank, and Population Council projections all assume a median incubation period of about 10 years. This is based on the best available evidence from industrialised countries (Bachetti and Moss 1989). The Census Bureau projection uses a shorter incubation period with a median time of about 7.5 years, based on the assumption that the incubation period is shorter in Africa than in the industrialised world (Anderson and Medley 1988). The best evidence for the length of the incubation period comes from cohort follow-up studies that have been conducted in the industrialised world. No similar studies have yet been completed in Africa although some are under way. However, partial studies and the preponderance of anecdotal evidence seem to suggest that the incubation period is shorter in Africa, perhaps due to poorer overall health status.

4.4 Perinatal transmission rate

The perinatal transmission rate is the percentage of babies born to HIV-infected mothers who acquire the infection from their mothers. This may happen during gestation, at the time of birth, or after birth through breastfeeding. Studies have found perinatal transmission rates from 15 to 50 per cent (European Collaborative Study 1991) but are generally assumed to be between 30 and 40 per cent in Africa. The UN, World Bank, and Population Council all used 30 per cent, while the Census Bureau used 39 per cent.

4.5 Methodology for incorporating AIDS deaths into the demographic projection

The UN and Population Council approaches use a separate AIDS model to calculate AIDS deaths. These deaths are then added to the deaths from other causes to calculate total deaths. This approach ignores the fact that some people who have an HIV infection will die from other causes before they die from AIDS-related causes. Thus, AIDS deaths will be overestimated. The World Bank and Census Bureau approaches used combined AIDS and demographic models that take this factor into account, yielding a more accurate estimate of AIDS deaths. However, since the non-AIDS death rate is usually quite low for the adults between the ages of 25 to 45, less than 1 per cent per year, the effect is relatively minor.

4.6 Length of time from AIDS to death

The length of time from AIDS to death is generally considered to be as long as two years in industrialised countries and as short as six months to a year in Africa. The period is quite short in any case and, therefore, will not have much influence on the projected number of deaths.

4.7 Age and sex distribution of AIDS deaths

The Census Bureau and World Bank both calculate the distribution of AIDS deaths as a result of the simulations. The UN applies a typical distribution to the total number of deaths projected by EpiModel. In all cases, the distributions are quite similar and, therefore, should have little effect on the overall number of deaths or lost births.

4.8 Start year of the epidemic

Little information is available on assumptions about the start year of the epidemic for the various countries involved. However, for most of the high-prevalence countries the epidemic probably started in the early 1980s or late 1970s.

Section Five: Results of simulations

In order to investigate the relative influence of each of these factors on the projections of the impact of AIDS, two projection models were used. First a simple AIDS model similar to EpiModel and the Bongaarts model was applied to aggregate data for the region. Second, the results from this model were checked using country-specific numbers in DemProj, a cohort component demographic projection model that incorporates the impact of AIDS (Stover 1994).

The regional projection model starts with the adult HIV incidence rate as the key input. The incidence rate is multiplied by the size of the adult population to find the number of new infections in each year. Next, AIDS cases resulting from these new infections are calculated by using the distribution of the incubation period. For example, of 1,000 new HIV infections in 1990, 2 might develop AIDS in 1991, 7 in 1992, 22 in 1993, 43 in 1994, and so on. AIDS deaths are assumed to occur one year after the onset of AIDS. The total number of adults alive with HIV is calculated from the number alive in the previous year minus those who have died from AIDS plus any new infections.

The adult prevalence rate is calculated from the number alive with HIV and the total number of adults. Next, the number of infants born with HIV infection is calculated as the product of the number of births (the population times the crude birth rate divided by 1,000), the adult prevalence of HIV, and the perinatal transmission rate. Child deaths are assumed to occur two years after birth. This basic model makes a number of simplifying assumptions but does capture the major dynamics.

This model was applied to the GPA data on HIV incidence for sub-Saharan Africa. Epidemiological parameters were set to the values used by the UN and Population Council. The model correctly matched the number of AIDS deaths for the period 2000–2005 projected by both the UN and the Population Council, about one million. Next the key assumptions were changed to match those used in the Census Bureau projection. Assumptions were changed individually and in combination. When all the assumptions were changed to match the Census Bureau projection, the model did match the total number of AIDS deaths for the 2000–2005 period from the Census projections, about 2.2 million. The number of deaths during this period was used to rank each of the assumptions in terms of its contribution to the differences between the projections of the Census Bureau and that of the others.

The results of these simulations are summarised in table 5. This table compares the average annual number of AIDS deaths during the period

Table 5. Factors explaining the difference between UN and Census Bureau projections of number of AIDS deaths

Simulation	Annual AIDS deaths 2000–2005 (millions)	% of difference between UN and Census Bureau projections explained
Base: UN, Population Council assumptions	1.01	—
Base + higher perinatal transmission rate	1.10	7
Base + short incubation period	1.18	14
Base + Census Bureau starting prevalence	1.20	16
Base + Census Bureau starting and projected prevalence	1.79	72
Base + Census Bureau starting and projected prevalence + short incubation period	2.07	99
Base + Census Bureau starting and projected prevalence + short incubation period + higher perinatal transmission rate	2.16	100

2000–2005 for each simulation with those reported by the UN and Population Council.

As table 5 shows, four factors explain the difference between the projections.

1 Increasing the perinatal transmission rate from 30 to 39 per cent explains 7 per cent of the difference between the two projections.

2 Reducing the median length of the incubation period from the 10 years used by the UN to the 7.5 years used by the Census Bureau explains 14 per cent of the difference when applied to the UN prevalence estimates. When applied to the Census Bureau estimates, this assumption becomes even more important, explaining 27 per cent of the difference (99 per cent – 72 per cent).

3 Replacing the base-year prevalence estimates from the UN with those of the Census Bureau accounts for 16 per cent of the variation in projecting AIDS deaths. This calculation understates the true impact of the differences in base-year prevalence, however, because it uses the UN estimates of incidence after 1990. Thus, there is a sharp discontinuity as incidence rates fall by half in 1990. In reality, adopting the higher prevalence estimates for the base year would require that the estimates of annual incidence also be increased.

4 Replacing the UN prevalence projections with those from the Census Bureau accounts for the largest amount of difference, about 56 per cent.

When all four factors are combined, 100 per cent of the difference is explained. The other factors are either quite similar across the different projections or have only a small influence on the outcome. It should be noted that the seemingly perfect match to the two different projections achieved by this simple model is partially illusory. The Census Bureau prevalence estimates should be adjusted downwards to account for the fact that they refer to the 15–49 age group only, while the UN estimates of AIDS deaths should be adjusted downwards to account for deaths of HIV-infected people to causes other than AIDS. Fortunately, these two factors roughly balance each other.

5.1 Impacts of AIDS on life expectancy

Life expectancy at birth is particularly sensitive to AIDS because deaths occurring to young adults and young children result in a large number of years of life lost. One of the most striking differences between the country-specific projections is the effect on life expectancy. A comparison of life expectancy projections for a number of countries from the UN and Census Bureau projections is shown in table 6.

Table 6. Projections of life expectancy at birth in 2020

Country	UN	Census Bureau
Botswana	64	38
Burkina Faso	57	40
Burundi	57	49
Cameroon	68	52
CAR	60	44
Congo	63	51
Côte d'Ivoire	62	49
Kenya	68	47
Lesotho	69	53
Malawi	55	34
Rwanda	55	37
Tanzania	63	41
Uganda	56	40
Zaire	63	54
Zambia	59	35
Zimbabwe	62	38
Brazil	73	68
Haiti	63	55
Thailand	75	74

Note: UN figures are averages of projections for the periods 2015–20 and 2020–25.
Source: UN 1996; McDevitt 1996.

The Census Bureau projections are, on average, 25 per cent lower than the UN projections. The largest differences, of around 40 per cent, occur for Botswana, Malawi, Zambia, and Zimbabwe. These are also the countries where the Census Bureau projection of HIV prevalence exceeds 30 per cent. This indicates that the prevalence projection is clearly the major factor in explaining the differences in life expectancy.

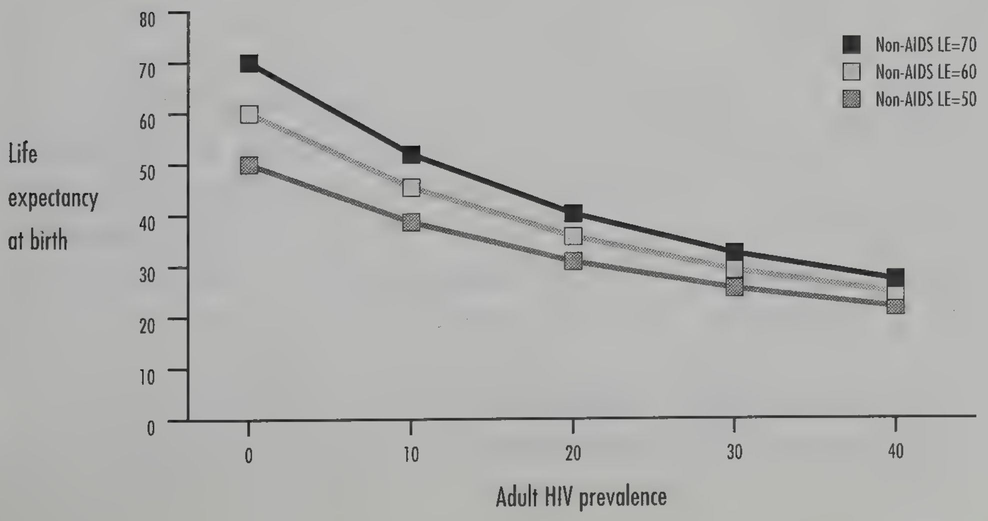
The slightly higher perinatal transmission rate used by the Census Bureau (40 per cent as opposed to 30 per cent) contributes only about 3 per cent to this difference. The faster incubation period used by the Census Bureau is probably the second most important factor. It would tend to increase the impact of AIDS on life expectancy by about 15 per cent. There is no systematic difference in the non-AIDS mortality assumptions, so this factor probably has a random and small impact.

5.2 The relationship between adult HIV prevalence and life expectancy

The exact relationship will depend on several factors, including the projected HIV prevalence, level and pattern of non-AIDS mortality, the perinatal transmission rate, and the HIV incubation period. The relationship between adult HIV prevalence and life expectancy can be examined in detail by using a hypothetical population projection. As a first step in the analysis, all factors other than adult prevalence will be held constant. The base projection used for this illustration has the following characteristics:

- The population size and distribution by age and sex in 1980 are similar to that of Zimbabwe.
- Life expectancy at birth in the absence of AIDS remains constant at either 50, 60, or 70 years.
- The total fertility rate remains constant at 6.0.

Figure 3. Relation between adult HIV prevalence and life expectancy, according to the assumption of non-AIDS life expectancy



- The perinatal transmission rate is set to 40 per cent.
- The median duration of the incubation period is set to 6 years for adults and 1.6 years for children.
- Average life expectancy after AIDS is one year.
- Adult HIV prevalence increases from 0 in 1980 to a plateau level (0, 10, 20, 30, or 40 per cent) by 1985 and remains at that level.

The projection is run for 50 years. Figure 3 compares the calculated life expectancy at the end of the projection with adult HIV prevalence. It gives a good approximation to the reduction in life expectancy caused by AIDS in any of the Census Bureau projections. For example, Burkina Faso is projected to have a life expectancy of 60.7 in 2010 in the absence of AIDS and 35.2 with HIV prevalence of 25 per cent in 2010. Using figure 3 you would reach roughly the same conclusion.

5.3 The impact of other factors on estimates of the effect of AIDS on life expectancy

The influence of other factors can be investigated by changing them one at a time and comparing the results with a base projection. The comparison projection used here is the base projection described above with an adult HIV prevalence level of 20 per cent. In the base projection, life expectancy at birth is reduced from 60 to 35.7.

- If the perinatal transmission rate is set at 30 per cent rather than 40 per cent, life expectancy would be decreased to 36.5. The reduction is only 3.5 per cent less than in the base case.
- If the non-AIDS life expectancy is assumed to be 70 rather than 60, AIDS-adjusted life expectancy would be 40.2. The reduction is 42 per cent of the non-AIDS life expectancy instead of 40 per cent in the base case.
- If the median duration of the adult incubation period is assumed to be 10 years rather than 6, life expectancy is reduced to 40.7. The reduction is 20 per cent less than in the base case.
- If the median duration of the adult incubation period is assumed to be 10 years and the median duration of the child incubation period is assumed to be 6 years (rather than 1.6), life expectancy is reduced to 42.8 (30 per cent less than the base case).

Clearly the assumption about non-AIDS life expectancy is important in the final determination on life expectancy in the presence of AIDS. In terms of the per cent reduction in life expectancy, the most important factor is the length of the incubation period. Using a slow incubation period for both adults and children changes the calculated life expectancy from 35.7 to 42.8. The same change could be achieved by using the fast incubation period and reducing the HIV prevalence level from 20 per cent to 12 per cent.

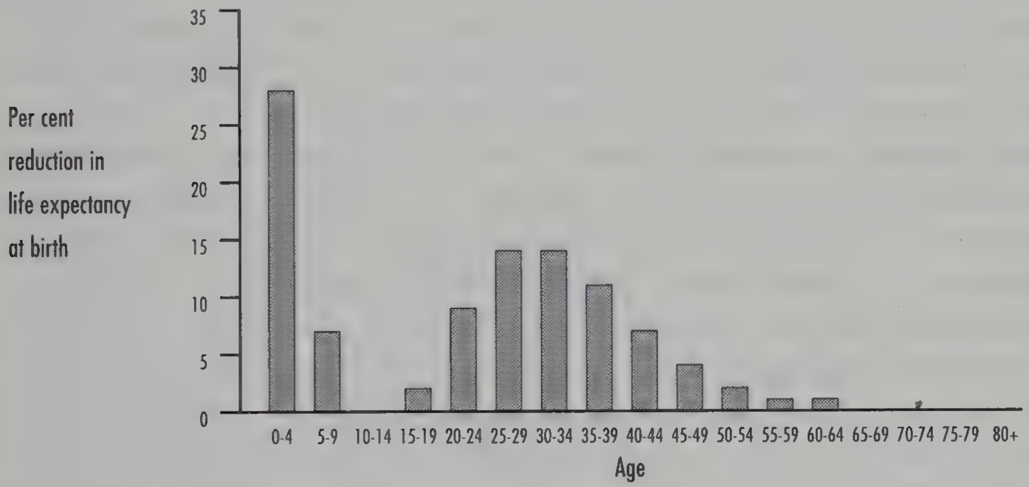
5.4 Reasons for such a large impact of AIDS on life expectancy

The impact on life expectancy is so large for two reasons. First, AIDS causes many child deaths, which represent the loss of a lot of potential life years.

Second, there is a large increase in deaths among those aged 20–44. This group typically has very low death rates. In the base projection with HIV prevalence at 20 per cent, deaths to the 20–44 age group are six to seven times as high as they are without AIDS.

The contribution of AIDS deaths at each age group to the decline in life expectancy is shown in figure 4 as a combination of the mortality rate at each age and the number of potential life years lost because of death at that age. Infant and child deaths account for 30 per cent of the decline. AIDS deaths in the age group 20–44 account for 50 per cent of the decline. Of course, these figures would be somewhat different with a different assumption about the age distribution of new infections, but the general magnitudes should not change too much.

Figure 4. Contribution of AIDS mortality by age group to the decline in life expectancy



Note that this figure does not imply that the reduction in life expectancy would be 35 per cent smaller if perinatal transmission were eliminated, even though the figure clearly shows that 35 per cent of life years lost are due to perinatal transmission. Children who do not die of AIDS as infants may develop AIDS and die as young adults. Thus, the full benefit of avoiding HIV infection to infants is not realised if adult HIV prevalence remains high.

5.5 The effect of the total fertility rate on the impact of AIDS on life expectancy

The projections made by the Census Bureau and the UN do not include any impact of HIV infection on fertility; thus, the total fertility rate (TFR) is not affected by HIV prevalence.

Some recent evidence suggests that fertility may be lower for HIV-infected women than for other women, even if they do not know their HIV status. A recent study in Tanzania found weak evidence that adult mortality due to AIDS leads to reduced fertility rates (Ainsworth et al 1995). In Uganda it was found that HIV-infected women had lower fertility rates than HIV-negative women. One study in the rural Rakai district found that age-specific fertility rates for HIV-infected women were 50 per cent less than those for women who were not infected (Gray et al 1977). Another study among a rural population in Masaka (Carpenter et al 1997) found that fertility rates were 20 to 30 per cent less among HIV-infected women. Since most women did not know their sero status, the reduced fertility rates were most likely due to biological rather than behavioural factors.

It may be important to include this factor in future population projections. However, even if fertility is reduced in settings such as rural Uganda, where fertility is generally quite high, it is not clear how this would affect fertility in a country such as Zimbabwe, where fertility is considerably lower due to the use of contraception. In that context, it may be that women would reduce their use of contraception in order to maintain roughly the same overall fertility rate. Even in Uganda, however, the overall impact is not particularly large. If 10 per cent of women of reproductive age are infected with HIV, then even if their fertility is reduced by 50 per cent, the overall reduction in the TFR for the entire population is only 5 per cent. Of course, this could become more severe in the future if Census Bureau projections of HIV prevalence of more than 30 per cent in Botswana, Malawi, Zambia, and Zimbabwe are realised.

In the example used above, life expectancy at birth is reduced from 60 to 35.7 due to adult HIV prevalence of 20 per cent. If we assume that the fertility of HIV-infected women is reduced by 50 per cent, then life expectancy is reduced to only 37.4 since fewer HIV-infected babies are born.

If the effect of HIV infection on fertility is ignored, then there is no impact of different fertility rate assumptions on life expectancy. (This assumes that non-AIDS mortality remains constant. In reality, a lower fertility rate should lead to lower non-AIDS mortality for children and mothers.) The country-specific TFR assumptions used by the Census Bureau and UN are different, but this has no impact on the life expectancy calculation; life expectancy is calculated from age-specific mortality rates. So the number of births does not matter, only the proportion of those births that die. That proportion can be affected by the assumption about the perinatal transmission rate but it is not affected by the TFR assumption.

Section Six: Discussion

In the last several years, three organisations have published country-specific estimates of the demographic impact of AIDS. The dramatic differences between these projections have led to confusion about which set of projections is more accurate. This paper has investigated the underlying causes for the different projections. The two most important factors are the estimate of current adult HIV prevalence and the projection of prevalence into the future. Somewhat less important are differences in assumptions about the length of the incubation period and the rate of perinatal transmission.

The perinatal transmission rate has been found to be as low as 15 per cent in Europe and as high as 50 per cent in some African countries. All the factors affecting this rate are not known, but it appears that two key factors that help to explain the difference between the European rates and the African rates are the general nutrition status of the mother and transmission through breastfeeding (Peckham and Gibb 1995). Breastfeeding may add 10 or 15 per cent to the overall transmission. If this is the case, then a higher rate (around 40 per cent) may be a better estimate of the rate in Africa where most babies are breastfed. Studies finding lower rates in Africa may have not followed up infants long enough to detect this additional mode of transmission.

The length of the incubation period and the factors that affect it are also not known with certainty. The best figures are based on long-term follow-up studies of homosexual populations in Europe and the United States. These rates may or may not apply to Africa. There are many indications that the incubation period is much shorter in Africa but no solid long-term follow-up studies have been completed (Nagelkerke et al 1990). Some reasons for a shorter incubation period in Africa include the poorer general health status of the population, a more virulent strain of HIV, and repeated reinfections. Although the definitive studies have not yet been completed, there does seem to be enough evidence to suggest that the transition from infection to AIDS occurs more rapidly in Africa than in Europe and the United States.

The base-year prevalence estimates for countries in Africa are another important source of variation. It is not possible to determine precisely the reasons for the differences produced by the US Bureau of the Census and the GPA. The Census Bureau has published the details of its estimations but the GPA has not. It seems likely, however, that the two organisations used much the same data. Since no recent national prevalence surveys are available, estimates need to be based on judgments about the most representative and best-quality small sample surveys. Different people may well reach different conclusions even when examining the same data set.

There are few surveys for rural areas, so assumptions about the difference between urban and rural prevalence introduce additional uncertainty. Recent UN estimates have increased substantially from the previous estimates while the recent Census Bureau estimates have been revised upwards for some countries and downwards for others. It may be that the final convergence of these estimates will be closer to the original Census Bureau figures than to the original GPA figures.

The projection of HIV prevalence into the future is highly uncertain. The Census Bureau projections are based on simulation results with the iwgAIDS model. These simulations essentially describe a future where prevalence either increases slowly for a long period of time or increases rapidly before levelling off at 17 per cent (medium scenario) or 32 per cent (high scenario). Individual countries can be anywhere in between these based on their current rate of prevalence increase.

The result of this approach is some projections of very high national prevalence, with six countries reaching 20 per cent or higher by 2005 (Tanzania, Central African Republic, Malawi, Rwanda, Uganda, and Zambia). Such high levels have been experienced by a number of African cities, but it seems implausible that prevalence would reach such levels for entire countries.

Recent evidence of plateau levels in high-prevalence cities of Eastern Africa and prevalence decline in Uganda seem to suggest that prevalence for entire countries may not proceed as rapidly as the Census Bureau projects. The UN assumption that incidence peaks 12 years after the start of the epidemic produces a more moderate epidemic that apparently avoids very high levels of prevalence. However, it remains to be seen whether the rural epidemics will remain at low levels once prevalence plateaus in urban centres or whether the rural areas will cause a second increase in incidence that carries total prevalence to higher levels than those projected by the United Nations.

On balance it seems that the most likely scenario is one combining the higher base-year prevalence estimates of the Census Bureau with more moderate prevalence projections, following the UN pattern. Combining these assumptions with a perinatal transmission rate of 39 per cent and a median incubation period of 7.5 years produces a projection of 1.35 million annual AIDS deaths for the period 2000–2005 in sub-Saharan Africa. This projection is about one-third of the way between the UN projection (1.01 million) and Census Bureau projection (2.16 million).

Future projections may have to expand the geographic coverage. By 2005 there may be as many AIDS deaths in Asia as in Africa. The country with the largest number of HIV infections today is probably India, where there are 2 million to 5 million HIV infections. Although the number of deaths is still small in India, since the increase in infections is recent, it will increase substantially in the coming years. HIV prevalence also seems to be increasing rapidly in China and Indonesia.

Although the levels are still low, the rapid rate of increase and the large populations in these countries make it necessary to consider them in any future projections of the demographic impact of AIDS. Since our knowledge of national prevalence rates in these Asian countries is limited, future estimates of AIDS deaths may vary even more in the future as demographers struggle to understand the scope of the epidemic in this new region.

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2

The effects of societal variables on urban rates of HIV infection in developing countries: An exploratory analysis

by Mead Over[1]

Section One: Introduction

One of the continuing puzzles of the AIDS epidemic is the variation from one country to the next in the percentage of the population infected with HIV (the HIV prevalence rate). Differences in the level of infection and in its rate of spread can sometimes be dramatic, with infection rates rising rapidly and tragically in one country and remaining stable at low or almost nonexistent levels in another.

Since HIV is transmitted between adults primarily by unprotected sex, once HIV is introduced among the sexually active population of a country, differences in the rate of spread must be attributable to differences either in sexual behaviour or in the infectivity of the virus. The three major causes of increased infectivity of the virus that have been proposed in the literature are:

- the presence of other 'classic' sexually transmitted diseases like syphilis or gonorrhoea (Grosskurth et al 1995)
- the absence of male circumcision (Bongaarts et al 1989)
- the specific subtype or 'clade' of HIV prevalent in the country.

The first two of these are related to socioeconomic and cultural factors: other sexually transmitted diseases are more prevalent when people have more unprotected sex and when people fail to get prompt treatment for such diseases; male circumcision is largely governed by traditional customs and religious beliefs. The third, the genetic variation in the virus itself, is still speculative and, since the mix of subtypes present in a country is not known for more than a few countries, must remain beyond the scope of this study.

While the determinants of an individual's sexual activity are subtle and complex, it is reasonable to expect that social, cultural, and economic conditions will influence the frequency of risky sexual behaviour. Furthermore, such aggregate-level social variables will also influence the prevalence of other sexually transmitted diseases and the percentage of the male population that is circumcised. Thus, it is plausible to imagine that variations in social and economic variables might predict the level of HIV infection in a given country. The purpose of this paper is to explore the available data on HIV prevalence in urban areas of developing countries in order to discover whether, and to what degree, available aggregate-level data can explain the observed HIV prevalence rates.

Section Two: The dependent variable and the functional form

The study of cross-country variation in HIV infection rates is greatly facilitated by the US Bureau of the Census' (BUCEN) compilation and dissemination of all data on such rates that has ever been published or presented at an international conference (US Bureau of the Census 1997). Each new release of their database is accompanied by a summary table containing their choice of the most representative recent estimate of HIV infection in each of four broadly defined population groups. The present analysis focuses on two of these:

- urban high-risk groups, which BUCEN defines as prostitutes or STD patients
- urban low-risk groups, defined as members of the general population or as pregnant women attending antenatal clinics.

HIV infection rates vary a great deal from one country to another. Of the 83 countries for which BUCEN has recent data, from 0 to 8.3 per cent of urban groups practising high-risk behaviour are infected. Fourteen countries have less than 1 per cent infection rates in these groups and at the other extreme another 14 have more than 45 per cent infection rates. According to BUCEN data on the infection rate among low-risk groups in 96 countries, infection remains at 0 per cent in 29 of the countries, but ranges up to 33 per cent in others.

The percentage of the population infected by any contagious disease typically follows an S-shaped curve, starting slowly, then accelerating, and then levelling off (World Bank 1997). In order to apply linear multiple-regression analysis to a variable with such a nonlinear underlying structure, we transform the HIV prevalence rate. First, we assume a maximum or 'ceiling' rate for each of the two risk groups that is greater than any rate yet observed: 90 per cent in the high-risk group and 40 per cent in the low-risk group. Let y be the infection rate in a certain risk group in the urban area of a given country and C be the ceiling assumed for that risk group. We define logit (y) for that risk group in that country as:

$$\log_e[y/(C-y)].$$

In order to avoid dropping observations where an infection rate was measured to be zero, low-risk zeros are set to 0.1 per cent and high-risk zeros to 1 per cent. These 'logits' of prevalence rates then become the variables to be explained by the statistical analysis.

Section Three: The explanatory variables

What aggregate variables are available that might plausibly explain the riskiness of sexual behaviour among the urban population of a country? The demand by men for commercial sex seems likely to be greater in cities where the ratio of males to females in the sexually active age range is greater than one. Furthermore, young men in the military and those who have recently arrived in the country might be less likely to establish permanent relationships with women and therefore be more likely to seek commercial sex. Variables are available to measure the ratio of urban men to women ages 20 to 39, the number of soldiers as a per cent of the urban population, and the number of foreign-born in the country as a percentage of the total population.

The number of people who are willing to supply commercial sex in a given city is likely to be greater when alternative employment is hard to find or poorly paid. Although no reliable measure of urban unemployment or wage rates could be found, the purchasing power parity measure of gross national product (GNP) per capita seems likely to be roughly correlated with the availability of good jobs to low-income people. And for any given level of average GNP per capita, the opportunities available to the poorest will be more attractive in a country where incomes are distributed relatively equally. We use the Gini coefficient as a measure of the inequality of income distribution, where a value of zero indicates perfect equality (i.e., everyone earns the same amount) and a value of one indicates perfect inequality (i.e., all income is received by a single person).

Since those practising commercial sex are more frequently women, a second relevant measure of inequality is the gap between male and female literacy rates. In a city of a given average income and a given distribution of that income between rich and poor, a larger gap between male and female literacy is likely to mean fewer conventional job opportunities or lower conventional wages for women. Incidentally, greater inequality between the rich and the poor or between men and women also seems likely to increase the bargaining power of men in the upper-income brackets who would like to purchase commercial sex and thus to augment the demand for, as well as the supply of, commercial sex.

A detailed understanding of the sociology of sexual behaviour in a given country would no doubt help to explain the willingness of people either to supply or to demand commercial sex. Furthermore, in many countries the epidemic is exacerbated by the frequent unprotected sex acts that occur outside the commercial market as usually defined. In the absence of published data on the cultural norms that shape a society's sexual practices, we use the percentage of the population that is Muslim as an indicator, which we expect to correlate negatively with both the supply of and the demand for risky sexual behaviour.

A final important consideration in explaining the current level of infection in a country is the time since the epidemic started. Although an ideal measure of this variable is not available, an alternative is the number of years since the first case of HIV infection or AIDS was reported. We also experiment with using regional dummy variables to proxy both the age of the epidemic and other difficult-to-measure social and cultural differences across regions.

Section Four: Regression results

Table 1 presents the results obtained when we regress the logit of infection rate on these eight variables.

- Columns (1) and (2) of the table present the means and standard deviations of the logits of infection rates and of the eight explanatory variables for a total of 72 countries.
- Columns (3) and (4) present the straightforward application of ordinary least squares regression for infection rates among high-risk and low-risk groups, independently.

Table 1. Regressions explaining the percentage of the urban population infected with HIV

			Regression results[b]					
Risk group	**Descriptive statistics[a]**		**High risk**	**Low risk**	**Low risk**	**Pooled**		
Column number	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Subset(s) of countries	A	B	A	A	A	A	A & B	A & B
Age of epidemic	10.90 *2.0*	11.18 *1.5*	0.53 *3.1*	0.42 *2.4*	0.24 *1.3*	0.47 *3.6*	0.63 *5.5*	0.61 *5.2*
GNP per capita (log)	7.9 *0.8*	7.2 *1.9*	-0.7 *-1.9*	-1.3 *-2.9*	-1.0 *-2.3*	-1.0 *-2.9*	-1.2 *-5.2*	-1.2 *-4.9*
Foreign-born per cent (log)	0.14 *1.4*	0.74 *1.2*	0.20 *1.1*	0.38 *2.0*	0.30 *1.6*	0.28 *2.0*	0.25 *1.9*	0.24 *1.8*
Per cent Muslim	24.0 *36.2*	23.7 *31.3*	-0.016 *-2.0*	-0.022 *-2.6*	-0.017 *-2.0*	-0.018 *-3.3*	-0.013 *-3.2*	-0.014 *-3.3*
Gini index of inequality	0.4 *0.1*	0.3 *0.3*	9.8 *3.2*	11.4 *3.5*	8.4 *2.5*	10.6 *4.0*	7.9 *3.7*	8.7 *3.8*
Male-female literacy gap	15.3 *10.3*	12.2 *12.6*	0.064 *1.7*	0.074 *2.0*	0.051 *1.4*	0.069 *2.4*	0.051 *2.2*	0.059 *2.4*
Urban M/F gender ratio age 20–39	1.1 *0.2*	0.9 *0.5*	3.3 *2.0*	2.5 *1.5*	1.5 *0.9*	2.9 *2.6*	2.4 *1.9*	2.2 *1.8*
Military forces as a per cent of the urban population	10.9 *13.1*	7.6 *7.5*	0.070 *3.1*	0.042 *1.7*	0.020 *0.8*	0.056 *3.1*	0.056 *3.1*	0.055 *3.1*
Constant			-11.3 *-2.5*	-7.2 *-1.6*	-3.7 *-0.8*	-10.2 *-2.6*	-8.5 *-2.7*	-8.5 *-2.7*
Logit of high-risk prevalence	-2.1 *2.2*	-1.6 *2.0*			0.33 *2.2*			
Logit of low-risk prevalence	-3.5 *2.4*	-3.0 *1.8*						
High-risk group dummy						1.6 *5.9*	1.5 *6.6*	1.5 *6.8*
Number of observations, maximum	50	22	50	46	46	96	132	132

			Regression results[b]					
Risk group	Descriptive statistics[a]		High risk	Low risk	Low risk	Pooled		
Column number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of countries	50	22	50	46	46	50	72	72
Max. missing variables per obs.	0	1	0	0	0	0	1	1
Number of missing values	0	22	0	0	0	0	36	36
Filled by means or fitted values							Means	Fitted
R^2			0.586	0.650	0.691	0.636	0.621	0.625
F-statistic of the regression			7.3	8.6	9.0	23.2	20.5	20.8
Degrees of freedom for F			(8, 41)	(8, 37)	(9, 36)	(9, 49)	(13, 71)	(13, 71)
Root mean squared error			1.5781	1.5794	1.5046	1.5380	1.5132	1.5049
F-test of region dummies (p-value)			0.092	0.036	0.016	0.051	0.052	0.154

a. For columns (1) and (2) the numbers for each variable are the mean and, in italics, the standard deviation. The number of observations is 50 for all variables in column A except the logit of low-risk prevalence, for which only 46 observations are available. In column B, variables have 22 observations, with the following exceptions: GNP per capita (21), per cent Muslim (20), Gini index (12), literacy gap (18), gender ratio (18), military forces as per cent of urban population (21), logit of high-risk prevalence (16), logit of low-risk prevalence (20).

b. For columns (3)–(8), the numbers for each variable are the estimated regression coefficients and, in italics, the t-statistics for those coefficients. In columns (6) – (8) standard errors are corrected for the heteroskedasticity induced by including two observations for each country. The heteroskedasticity corrections are performed by using the 'cluster' option on STATA's 'regress' command. In columns (3)–(6) there are no missing values of any variables. In columns (7) and (8) there is no more than one missing value on any observation, but individual variables can have several missing values according to the pattern described in note a for column (2). Missing values are replaced by their means (7) or by their fitted values (8).

- Column (5) expands the model of column (4) by allowing the (logit of the) current period infection rate among high-risk groups to affect the infection rate among low-risk groups.
- Columns (6) through (8) pool the data from the high- and low-risk groups in order to estimate a single regression equation for both groups.

What lessons can one learn from these regressions? In order to interpret the coefficients, one must keep in mind that the dependent variable is measured in 'logits' as defined above. At the sample mean, a one-unit change in the logit is equivalent to a change of about 4.3 percentage points in HIV infection among low-risk urban adults.

Columns (3) and (4) demonstrate, first of all, that the eight selected societal variables are capable of explaining one-half to two-thirds of the cross-country variation in infection rates. Since cross-country regressions are known for their typically poor explanatory power, these regressions can be said to fit remarkably well. Furthermore, in each regression all coefficients have the expected sign and six of eight have t-statistics equal to 1.9 or larger, indicating that the associated coefficients are statistically significant at the .05 significance level. These fits are obtained without including regional dummy variables in the regressions.

As is indicated in the last row of table 1, the hypothesis that all regional dummies are jointly equal to zero can only be rejected at the .05 significance level in two of the six reported regressions. Therefore, we do not report the estimates that include the regional dummies for any of the regressions.

The regression equations (3) and (4) can be thought of as the 'reduced form' of a two-equation structural model in which each of the two urban infection rates, together with a subset of the societal variables, affects the other. Such models are difficult to specify, identify, and estimate on aggregate data unless one is willing to adopt substantial additional prior assumptions. One plausible simplifying assumption is that the infection rate in the high-risk group affects that in the low-risk group, with no feedback in the other direction. Under this assumption the structural model is said to be 'recursive' and can be estimated without bias by ordinary least squares. Equations (3) and (5) are the estimates of the high- and low-risk equations in the recursive model.

The estimates in column (5) support the recursive model, but not to the exclusion of all other social determinants of low-risk infection. This conclusion follows from the fact that the high-risk infection rate has a statistically significant and sizeable coefficient of 0.3 in column (5), but does not drive all of the other societal variables out of the regression. For the average country, a coefficient of 0.3 approximates the elasticity of low-risk prevalence with respect to high-risk prevalence and implies that an increase of 10 percentage points in the infection rate in the high-risk group (e.g., from 10 per cent to 20 per cent infected) is associated with an increase in infection in the low-risk group of a third of a percentage point (e.g., from 1 to 1.33 per cent infected).

Comparing columns (4) and (5), the variables whose coefficients are most attenuated by the inclusion of the high-risk infection rate are the age of the epidemic, the urban male-female gender ratio, and the size of the military as a proportion of the urban population. The evidence of the regression suggests that, while the other five variables directly affect both low- and high-risk infection rates, these three variables act primarily to raise the infection rate in the high-risk group, which in turn drives up the low-risk infection rate. Since the recursive model requires more assumptions than the reduced form model, we focus on the reduced form results in the rest of this paper.

Another striking feature of regressions (3) and (4) is the similarity of their coefficients. Though collected from distinct population groups within the country, the two different measures of infection rate are similarly affected by the eight societal variables, and this is consistent with their being two distinct measures of the same epidemiological process. This similarity is the motivation for increasing the power of the estimates by pooling the low-risk and high-risk data into the same regression equation, which is done in columns (6) through (8). After allowing for a dummy variable to distinguish between the low- and high-risk measures, a Chow test of the hypothesis that the regressions can be pooled cannot reject that hypothesis, even at a 25 per cent significance level.

Pooling the data on low- and high-risk groups into a single regression improves the precision of the coefficient estimates substantially, even after taking into account the within-country correlation between the residuals from the low- and high-risk groups. Note that the pooled estimates in column (6) are a weighted average of the estimates for the two groups separately and that the t-statistics and F-statistic are higher than they were in columns (3) or (4). All t-statistics now exceed the critical value associated with the 5 per cent significance level.

4.1 Admitting 22 additional countries

The 50 countries included in set A and used to estimate equation (6) include 17 from sub-Saharan Africa, 15 from Latin America and the Caribbean, 14 from Asia (including India and China), and 4 from the Middle East. One can wonder whether the results in column (6) are specific to these countries, which have complete data for the eight independent variables and for one or both of the two prevalence rates. Columns (7) and (8) expand the sample to admit the 22 additional countries (set B), which are missing no more than one of the eight explanatory variables. Fifteen of these are from sub-Saharan Africa, five from Latin America and the Caribbean, and one each from Asia and from the established market economies. Descriptive statistics for the available data on countries in set B are presented in column (2).

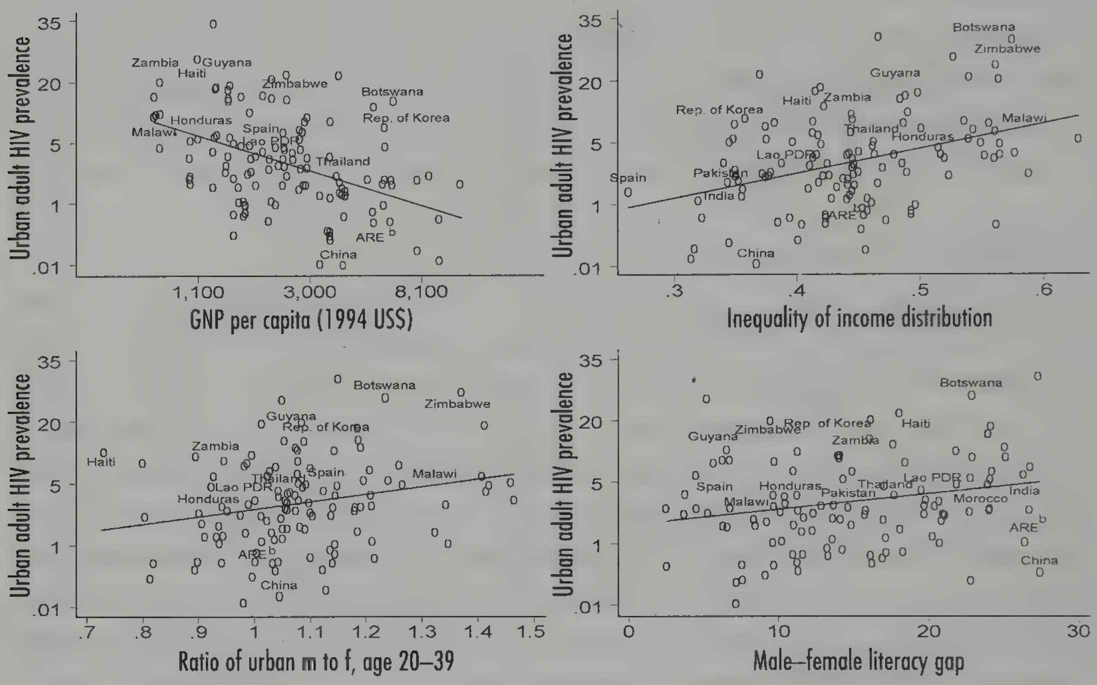
In order to include these 22 additional countries without dropping any of the eight explanatory variables, we impute the missing values of each of the eight variables. Columns (7) and (8) differ only in the imputation method used. In column (7) the missing values are replaced by their means and in column (8) by their predicted values based on a regression in the subset of data for which they are present. Greene (1993) discusses these two approaches under the terms ‘zero-order’ and ‘first-order’ mean replacement. (Rather than replace the missing value directly with its imputed value, we zero-fill the missing values and create an auxiliary variable containing the imputed values.)

The number of additional variables created in this way equals the number of original explanatory variables that contain at least one missing value. The coefficients of these auxiliary variables are not reported because they are typically very similar to the coefficients of the original variables and their inclusion would make the table unwieldy. However, the number of such variables is reflected in the number of degrees of freedom reported for the F-tests in table 1. (Full results are available from the author.)

Since the estimates in columns (7) and (8) are quite similar, we focus attention on the simpler approach in column (7), in which missing values are replaced by their means. Although the fit of equation (7) is slightly worse than that of (6), we prefer to use equation (7) because its inclusion of a total of 72 countries makes it more representative of the global epidemic.

Figure 1 shows the associations of four of these variables with the percentage of urban adults infected with HIV as estimated in column (7) of

Figure 1. Poverty and gender inequality spread AIDS



Note: The vertical axis measuring HIV infection has been transformed to a logarithmic scale. Points on a given scatter plot represent the data for individual countries after removing the effects of the other seven variables included in the regression analysis. Income inquality is measured by the Gini coefficient. On average, the passage of 1.6 years is associated with an increase of about one logit, or about 4.3 percentage points in the prevalence rate of low-risk urban adults. Source: Column (7) of Table 1.

table 1. Each panel of figure 1 presents the relationship between one of these societal variables and HIV infection after purging that variable and the HIV infection rate of the effects of the other seven explanatory variables. The fitted lines show the estimated slope coefficients from column (7) of table 1. The figures were constructed by the 'avplot' command in the STATA software package (StataCorp 1997). The vertical axis is scaled in logits as defined above.

4.2 Poverty and income inequality

The top two panels of the figure demonstrate that, holding constant the other variables, both low income and unequal distribution of income are strongly associated with high HIV infection rates. For the average country a $2,000 increase in per capita income is associated with a reduction of about 4 percentage points in the HIV infection rate of low-risk urban adults. Although the negative relationship between GNP per capita and HIV infection is strongly supported by this international data, individual-level data do not always show a negative relationship between individual or household income and HIV infection and frequently demonstrate the converse. Chapter 3 of *Confronting AIDS* (World Bank 1997, 127–32) discusses the contradictory individual-level studies of this topic and possible ways to reconcile them with the aggregate finding reported here. (See also Ainsworth and Semali 1998 and Menon et al 1998 in this volume.)

Reducing the index of inequality from 0.6 to 0.3, the difference in inequality between, say, South Africa and Nepal, is associated with a reduction in the low-risk infection rate by about 3 percentage points. These findings suggest that rapid and fairly distributed economic growth will do much to slow the AIDS epidemic.

4.3 Gender inequality

When examining the influence of gender inequality on HIV infection, one must hold constant as much as possible other influences, which may be correlated with gender inequality across countries. The bottom two panels of figure 1 show that, after controlling for the percentage of the population that is Muslim, per capita GNP, income inequality, and four other societal characteristics, two measures related to gender inequality are associated with higher HIV infection rates.

The first of these, the ratio of males to females in urban centres, varies remarkably across countries, with some countries having fewer male urban residents than female and others having 40 per cent more males. Other things being equal, one might suppose that commercial sex will be more common in cities where men greatly outnumber women and that HIV levels will therefore be higher. The evidence of the lower left panel of figure 1 is that cities in which men ages 20–39 greatly outnumber women do in fact have significantly higher HIV infection rates. For the average country, increasing the job opportunities for young women so that the ratio of males to females in urban areas falls, say, from 1.3 to 0.9, would decrease the low-risk infection rate by about 1 percentage point.

The second measure related to gender inequality included in the analysis is the gap between adult male and female illiteracy rates. Again there is great variation across countries, with the literacy rate among men being as much as 25 percentage points higher than among women in some countries. When women are much less literate than men, they may be less able to bargain effectively with men and thus be at greater risk in sexual encounters. Furthermore, illiterate women will have difficulty finding jobs and thus may depend more on sexual relationships for economic survival, again reducing their bargaining power. The lower right panel of figure 1 supports these ideas, suggesting that the average country that eradicates a 20 percentage point literacy gap between the genders can expect urban low-risk HIV infection to be about 1 percentage point lower.

4.4 Economic growth

From the evidence of figure 1, a country that improves per capita income and reduces inequality, for example, by implementing broad pro-growth investment policies that generate jobs, will reduce its risk of suffering an AIDS epidemic or help to minimise an epidemic already under way. If in addition, the country acts to close the literacy and urban employment gaps between men and women, HIV will have even more difficulty spreading. Unfortunately some of the very processes that might achieve these goals can also stimulate the spread of AIDS. And other policies that sometimes accompany growth, without necessarily contributing to it, can likewise worsen the epidemic.

An open economy is recognised as a key requirement of rapid growth. Openness primarily refers to the ease with which entrepreneurs can move goods and capital across national borders, but a higher degree of openness to trade and financial flows is typically also accompanied by a greater degree of openness to movements of people, including immigration. Moreover, some studies have suggested that migration itself is correlated with growth. This would hardly be surprising, since immigrants are often among the hardest working and most enterprising people in any country.

However, the regression analysis suggests that countries with larger immigrant populations tend to have larger AIDS epidemics: other things being equal, a country in which 5 per cent of the population is foreign-born can expect to have an infection rate about 2 per cent higher than a country with no foreign-born residents.

4.5 Militarisation

A final factor, which in the regression analysis is not necessarily associated with development but can be readily affected by government policy, is the level of militarisation. In developing countries military forces are often based near urban centres and consist almost entirely of unmarried men. Using a variable that measures the number of men in the nation's armed forces as a percentage of its urban population, the regression analysis shows that even after controlling for the ratio of male to female urban residents, countries with more soldiers will have higher infection rates. For the average country, reducing the size of its military from 30 per cent to 12 per cent of the urban population will reduce seroprevalence among low-risk urban adults by about 1 percentage point.

4.6 Other variables

The age of the epidemic is statistically significant in all specifications except, as noted above, in column (5). The size of the column (7) regression coefficient on the age of the epidemic is consistent with an average rate of increase of 0.7 percentage points per year in the infection rate among low-risk groups and about 5.7 percentage points per year in the infection rate among those at high risk.

We have experimented with a variety of other variables that might plausibly have been thought to influence HIV prevalence. Introduced one at a time, none of the following variables contributes to a statistically significant degree to explaining the cross-country variation in HIV prevalence: the ratio of male to female secondary school enrolment, rate of urban population growth, percentage of male population circumcised, the availability of condoms in 1982 and 1990, and public health expenditure as a percentage of gross national product.

Section Five: Conclusion

An exploratory analysis of the determinants of HIV infection rates demonstrates a surprisingly strong relationship between eight aggregate variables and the infection rate of low-risk urban adults. The fact that low-risk and high-risk infection rates display similar relationships with these eight variables leads us to pool the two measures of severity in order to increase the power of the estimates. The results of the analysis are broadly consistent across several different specifications and with or without the inclusion of an additional 22 countries that have missing values on one or more of the eight independent variables. The results support several hypotheses that have been common in the literature on AIDS:

- Both poverty and income inequality facilitate the spread of AIDS.
- Inequality between the sexes, either in access to urban jobs or in literacy, can speed the spread of AIDS.
- Countries with more soldiers have higher HIV infection rates, a finding that points to the importance of condom promotion among the military.
- High-risk groups are the driving force of the epidemic.

Although the variables used to capture openness of the economy and of the frontiers to labour force migration are imperfect, the percentage of the population that is foreign-born has a statistically significant positive effect on infection rates in two of the six reported regressions. This finding suggests that some of the processes that are friendly to growth might also exacerbate the AIDS epidemic, unless public health officials take compensating protective measures.

A path toward control of the AIDS epidemic is economic and social development, implemented so as to reduce, rather than to increase, income and gender inequality. But policies to speed such growth are already desirable for general development reasons. The analysis here points to the need for additional policies to reduce risky behaviour among soldiers, sex workers, and others who are most likely to contract and spread HIV.

Furthermore, the regressions fail to explain fully two-fifths of the variation in infection rates across countries. Some of this additional variation might be explained with better measures of the variables we are already analysing. But most of it is undoubtedly due to subtle characteristics of the cultures of these countries and of their efforts to combat the AIDS epidemic that will remain difficult or impossible to measure at the aggregate or national level. Factors such as the degree of leadership provided by national figures or the quality of peer education programmes among sex workers will ultimately have an enormous impact on the success of national HIV control efforts. Until an HIV vaccine becomes available, effective control policy will require a combination of fair, pro-growth macroeconomic policies with multi-pronged, sector-specific, tightly focused interventions that ensure reductions in risky behaviour of those most likely to contract and spread HIV infection, while protecting them from discrimination.

Note

1 The analysis reported here builds on earlier work by Over and Piot (1993) and benefits from the author's access to an incomplete draft on the same topic by David Bloom and Ajay Mahal (1997). The paper could not have been written without the research assistance of Samantha Forusz.

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3

Does structural adjustment cause AIDS? One more look at the link between adjustment, growth, and poverty

by Christine Jones

Section One: Introduction

The possible link between structural adjustment and HIV infection is part of a larger debate on the impact of structural adjustment on people's well-being that was initiated by the UNICEF-sponsored debate on adjustment with a human face. This paper first reviews the hypothetical links between structural adjustment and the economic variables that in turn are thought to be related to the prevalence of HIV. It then presents the results of multivariate regression analysis for some 90 adjusting and non-adjusting counties in the 1980s and early 1990s, showing the relationship among adjustment, economic growth, poverty, and government health spending.

The literature on structural adjustment and AIDS offers a number of useful hypotheses as to what might be the relationship between structural adjustment and HIV infection. (See also the discussion in *Confronting AIDS*, World Bank 1997, and Over 1998, in this volume.)

1 Structural adjustment programmes, with their emphasis on fiscal discipline, might lead to a decline in government health expenditures, which in turn increase the rate of HIV infection. The possible links between government health expenditures and HIV infection might include:

- less funding for the treatment of STDs, which increases the risk of transmitting HIV
- less funding for blood screening
- less funding to support good hygienic practices in clinics (e.g., sterilisation of equipment)
- less provision for public education campaigns.

In addition, structural adjustment programmes, if they lead to a decline in education expenditures, could increase the population's chance of contracting HIV by reducing the efficacy of public education campaigns and in general people's ability to be aware of the risks of infection.

2 Structural adjustment programmes might cause or intensify economic recessions and lead to an increase in poverty. Alternatively, even if adjustment programmes do not lead to economic recessions, they may lead to greater inequality and rates of poverty. As incomes decline, people engage in more risky behaviour; they do not have the resources to seek out health care that would lower their risk of contracting HIV; they are more likely to be malnourished, which would increase their risk of contracting HIV if they are exposed to it; and they are more likely to emigrate to urban areas, where the prevalence of HIV infection is higher.

3 Structural adjustment programmes, through their focus on increasing incentives for greater trade openness, promote an export-oriented pattern of economic growth that might increase the chance of contracting HIV. Greater incentives for exporters lead to the creation of more dense trading networks between rural and urban sectors with the growth in export crop production, and an increase in urbanisation where export-oriented industries are located. Improvement of transportation networks (which may or may not be directly facilitated by adjustment operations) might enhance the spread of HIV.

4 Structural adjustment might lead to the marginalisation of women, which makes them more vulnerable to HIV transmission. Erosion of women's real incomes and increasing poverty intensify gender inequality and weaken women's ability to determine the mode of sexual relations with their husbands and to insist on less risky practices. Increasing poverty may increase the likelihood that women will become commercial sex workers (see hypothesis 2 above).

Section Two: The problems of determining the economic impact of structural adjustment programmes

One of the problems with evaluating the impact of structural adjustment programmes is the problem of the counterfactual – what would have happened in the absence of the programme. When faced with balance of payment problems, for example, some countries try to impose currency and trade restrictions, which often result in the creation of parallel markets, rather than correcting the underlying causes of the crisis through adjustment. As painful as adjustment might be, the alternatives might be even worse. Rationing, import compression, a breakdown in government services, and high inflation, for example, have negative consequences for growth, investment, and poverty outcomes.

In evaluating the impact of structural adjustment programmes, researchers have typically approached the problem of establishing the counterfactual in three ways:

1 The first method is to compare the performance of adjusting countries with non-adjusting countries. This is the with/without comparison. This method poses various problems.

- First, not all countries undertake adjustment at the same time. So the group of adjustors contains countries that began the adjustment process at different points in the past and are thus presumably at different points in the economic recovery process.
- The second problem is the comparator set of countries. Clearly one does not want to compare the performance of the group of adjustors to countries that have managed their economies well and thus are not in need of adjustment. It is better to use a comparator set of countries that are in need of adjustment, but have not adopted adjustment programmes. One problem is that the factors that predispose countries to adopt adjustment programmes may make them structurally or otherwise different from the non-adjusting countries, thereby limiting the relevance of the comparison.

2 The second method is to compare the pre- and post-adjustment economic performance of countries that undertook adjustment programmes. Sometimes this is done by choosing a cutoff point, say 1986, as in *Adjustment in Africa* (World Bank 1994), and by comparing the economic performance of a group of countries in the two different time periods. Alternatively one could date each country's pre- and post-adjustment period differently. The problem with this approach is that it does not control for external shocks or world economic performance that may influence a country's rate of growth at a particular point in time.

3 A third approach is to create an economic model to predict what would have happened under alternative scenarios (see, for example, Dorosh and Sahn 1993). The drawback of this approach is that it is difficult and time consuming to construct such models, which must be tailored to a specific country. The accuracy of the predictions is also questionable in cases where large disequilibria are present.

A more general problem is the nonuniformity of adjustment programmes. Despite what is often assumed, there is no blueprint for adjustment. Countries differ greatly in the content and speed of the reforms undertaken, and some approaches to reform have proved more effective than others. For example, the CFA franc–zone countries in sub-Saharan Africa for many years eschewed a nominal devaluation as part of their adjustment programmes. They opted to try to reduce their overvalued real exchange rates through public expenditure reduction and factor market deregulation, in contrast to many of the non–franc zone countries, which ultimately dealt with their real overvalued exchange rates through nominal devaluation. As the ensuing great depression in the franc zone countries showed, the CFA franc–zone countries were not able to achieve the real devaluation needed to restore competitiveness through internal measures alone.

Sometimes key reforms are not included in adjustment programmes because they are politically too sensitive, while at other times countries do not implement key reforms that are agreed to. Thus, one cannot assume that receipt of an adjustment loan implies the same policy reforms. It is therefore useful to examine whether programmes that implemented certain proximate objectives (for example, reducing inflation, reducing real exchange rate overvaluation, reducing fiscal deficits, undertaking trade liberalisation, etc.) achieved better results than countries whose adjustment programmes did not achieve those objectives. In evaluating the impact of adjustment, it is important to distinguish the receipt of the loan from the reforms actually achieved. World Bank (1994) discusses reform implementation in the context of adjustment lending.

There are two major studies that look at the impact of structural adjustment on health expenditures (Tan et al 1995; van der Gaag and Barham 1996). Both papers look at a sample of countries classified according to the criteria used by the World Bank (1992). The World Bank divides countries into three categories:

- The first group is the intensive adjustment lending countries (IAL), those countries that received at least two structural adjustment loans or three sectoral adjustment loans, all effective by June 1990 and with the first operation effective by June 1986.
- The second group, the other adjustment lending countries (OAL), consists of those countries that have received at least one adjustment loan effective by June 1990.
- The third group is the non-adjustment lending countries (NAL), consisting of those countries that had not received adjustment loans by June 1990.

The Tan et al study compares 12 IAL countries with eight NAL countries. The van der Gaag and Barham study splits up the NAL countries into two subgroups: those whose economies were growing during the 1985–90 period (NAL+) and those whose economies did not grow (NAL-). Their sample of countries is far bigger, comprising all the countries included in the World Bank study (1992). The data in the Tan et al study span the period from 1980 to 1990, while the data in the van der Gaag and Barham study cover a longer period, from 1970 to 1993.

This categorisation of countries was used in a regression analysis to establish in more detail the connection, if any, among structural adjustment, growth, and poverty.

Section Three: Empirical evidence on the link between policy reforms and health expenditure

3.1 Policy reform and GDP growth

The simple group averages show that the IAL countries outperformed the OAL and the NAL- countries in the late 1980s and early 1990s in terms of growth rates of GDP. Controlling for the initial level of GDP per capita, regression analysis confirms that the IAL countries had significantly higher rates of growth during 1985–88 than the OAL and the NAL- countries. There were no significant differences among groups in the third period (1989–93). There was a significant rebound of the IAL group's growth rate between 1981–84 and 1985–88. Little of the variation in GDP growth rates is explained, however, by a country's adjustment loan status.

Controlling for policy variables, we find, as expected from other research, that lower inflation rates and more open trade policy are associated with higher rates of GDP growth. An increase in the terms of trade is also associated with higher rates of growth but an increase in aid flows is not.

Including the policy variables, however, does not completely drive out the adjustment dummy variables. While the differences among the groups are not significant in the second period as in the simple regressions, the growth rate is significantly higher in the 1985–88 period compared to the prior period for the IAL countries, implying that the turnaround in growth was stronger than expected, given changes in the policy variables.

A dummy variable was added for the franc zone countries in sub-Saharan Africa, reflecting the fact that the currency of the zone was strongly overvalued even though the black market premium was close to zero. The franc zone dummy variable was significant and negative. The sub-Saharan Africa dummy variable was not significant.

These findings are consistent with those reported in a World Bank report on adjustment lending (1992). Comparing the GDP growth rates in the 1970s with those in the 1980s, the report found that adjustment in the intensive adjustment lending countries was associated with substantial medium-term gains to middle-income countries, but with more moderate gains to low-income countries.

Even if better policies lead to higher growth rates, in the short term, the impact of policy reform may lead to a contraction in output. Khan's (1990) study of the impact of IMF-supported adjusted programmes shows that GDP fell in the programme year and also in the second year, though the effect is lessened in the second year. Easterly (1996) finds, however, that stabilisation need not impose a cost even in the short term. He shows that a reduction of inflation from high initial levels is associated with an expansion of output, and that the expansion begins with the first year that inflation declines.

In sum, the regressions suggest that policy reforms do not lower growth in the medium term; they are based on four-year periods (five years in the case of the third period) and do not find any significant difference in growth rates between the IAL and the NAL+ (albeit a limited number) countries, after controlling for policy variables.

3.2 Government expenditure

Neither the OAL nor the IAL countries had a significantly different level of expenditures from the NAL+ countries. There were no significant changes between the first and second or between the second and third periods in the level of expenditures in any of the country groupings. Thus, adjustment lending countries do not have significantly lower levels of government expenditure than the non-adjustment lending countries.

Controlling for policy variables, we find that higher black market premiums are associated with lower government expenditure. More open economies have lower expenditure, while higher levels of aid are associated, not surprisingly, with higher levels of government expenditure. The inflation variable is not significant. This suggests that stabilisation type reforms do not result in lower government expenditure.

In fact, in the third period, controlling for the policy variables, the IAL countries have a significantly *higher* level of government expenditure than the NAL+ countries. Thus, the data do not support the contention that countries receiving adjustment loans or making policy reforms have been forced to cut government expenditure to uneconomic levels.

3.3 Health expenditure as a share of government expenditure

Health expenditure as a share of government expenditure does not vary systematically either by adjustment lending status or with economic policy or with the level of aid. There is no trend in health expenditure across groups over time. Since the health expenditure data are only for central government expenditure, and the amount of locally financed health expenditure varies across countries, it may be that if we had complete data on health expenditure we would find more systematic relationships.

Therefore, the regression results do not support the hypothesis that adjustment loans or policy reforms have reduced central government health expenditure as a share of government expenditure.

3.4 Changes in real public health spending per capita

Van der Gaag and Barham (1996) focus their analysis on the changes between the first and second period and between the second and third period in real public health spending per capita. Our regression analysis showed that there were no significant differences across country groups in the change in real per capita health spending, nor did changes in the policy variables have a significant impact. The fact that there is no significant relation between policy variables or adjustment loan dummy variables and health spending as a share of government spending may explain the lack of significant relationship between the change in real public health spending and policy variables.

Thus, the regression analysis does not provide support for the hypothesis that adjustment programmes led to large cuts in real health spending per capita.

Section Four: HIV infection, adjustment, and poverty

A considerable share of health care in many countries is financed privately, even among the poor. If adjustment programmes reduce household incomes, then people may be less likely to seek treatment of conditions that increase their chance of contracting HIV infection if they are exposed. A reduction in household incomes could also increase HIV infection if household members seek to augment their incomes in ways that imply a greater chance of exposure to AIDS. This could happen, for example, if they become commercial sex workers or move to urban areas in search of a job where the prevalence of HIV is higher.

4.1 Household incomes

The evidence does not support the hypothesis that adjustment programmes reduce household incomes, at least in the medium term. Several different indicators can be used to infer what happened to household expenditures under adjustment. Ranging from the least to the most direct, one can examine what happened to GDP growth rates, under the assumption that increases in growth tend to be accompanied by increases in mean household expenditure; private consumption per capita; and household expenditures estimated via household survey data.

4.2 Private consumption

As discussed above, good macroeconomic policies are associated with higher GDP per capita growth rates. A second broad indicator associated with welfare is private consumption. In an analysis paralleling that of growth rates, van der Gaag and Barham (1996) show that private consumption went up in the IAL countries (and also in the NAL+ group) and down in NAL- countries over the four periods. In contrast, in the OAL countries, private consumption peaked in 1981–84 and then declined. This is attributed to the fact that a few countries (Algeria, Cameroon, Gabon) did particularly poorly in the last period.

4.3 Under-five mortality rate

A third broad indicator is the under-five mortality rate (U5MR), widely viewed as the best indicator of social development. The regression results show that there was broad progress in each of the country groupings, with no clear trend associated with adjustment. Progress on this front is attributed to the steady increase in immunisation coverage, despite difficult economic conditions in the 1980s. One could hypothesise that the types of policies associated with structural adjustment could result in an increase in under-five mortality rates if, for example, they resulted in cuts in health expenditures or created more poverty for a given level of GDP.

If we control for the effects of policy variables and the initial level of per capita income, we find that the only policy variable that is significant is the inflation variable, with higher inflation being associated with higher levels of U5MR. None of the adjustment dummies is significant. Again, the evidence does not support the contention that being a recipient of an adjustment loan or undergoing policy reform results in higher levels of under-five mortality.

The significance of the inflation variable in explaining under-five mortality is interesting. One hypothesis is that countries with inflation rates in this range have a greater level of inequality, which for a given level of GDP, would imply a higher incidence of poverty. The incidence of poverty tends to be associated with a higher rate of under-five mortality. The link between inflation and inequality has not been established, however. Another explanation is that the inflation dummy is proxying for the effects of extreme civil disturbance. Or alternatively, the very high values of inflation could be skewing the results. Including a dummy variable for those countries with inflation rates greater than 100, we found that the inflation variable was still significant. If, however, we included a dummy variable for countries with inflation rates more than 50 per cent, the dummy for inflation rates greater than 50 per cent was significant, but not the inflation variable. Given the country sample, the dummy does not seem to be proxying for the effects of civil war.

4.4 Household consumption

None of these indicators directly measure household-level consumption. Reliable household survey information is considerably more limited. A recent study by the World Bank (1995) examined the relation between poverty reduction and adjustment loan status. Using the same classification of adjustment recipient loan status as van der Gaag and Barham, the study found that the incidence of poverty fell in most of the IAL countries for which data were available.

4.5 Poverty

It is instructive to look at whether the trends in poverty reduction correspond to growth trends. In only three cases (Brazil, Honduras, and Mexico) was the trend different. In Brazil and Honduras, the GDP per capita growth trend was positive, but the incidence of poverty increased, while in Mexico, the opposite occurred. Given the strong association between poverty reduction and a positive rate of GDP per capita growth, on the one hand, and between positive rates of GDP per capita growth and good macro policies on the other hand, we would expect that poverty would decline in countries where there was an improvement in macroeconomic policies.

Using the regression coefficients from the GDP growth regression, we calculated a policy score based on the values of the inflation, black market premium, fiscal balance, and openness variables for the year during which the survey was conducted as well as the two years preceding it.

In 17 of the 22 cases, the policy index changed in the same direction as the trend in poverty reduction. In four cases (Ghana, India, Pakistan, and Sri Lanka), there is a small negative change in policies, but a positive trend in poverty reduction and GDP per capita growth. In the case of Honduras, there was a small improvement in policies and GDP increased, but poverty was not reduced. This conclusion broadens the results presented in Demery and Squire (1996), who found that an improvement (deterioration) in macroeconomic policies in six sub-Saharan African countries was associated with a reduction (increase) in poverty.

As Demery and Squire point out, however, even though the incidence of poverty declined overall in the countries that undertook policy reforms, in several of the countries studied (Nigeria, Tanzania, and Kenya) 'hard-core' poverty actually increased among the poorest of the poor. In other countries, such as Ghana and, more recently, Côte d'Ivoire, urban poverty clearly increased even though poverty in the rural sector, where the majority of the poor live, diminished or showed little change. These findings could have worrisome implications for the spread of HIV, if an increase in urban poverty or a decrease in household expenditures of the poorest segment of the population increases the risk of contracting HIV.

4.6 Inequality

While evidence is mounting in support of a positive link among policy reforms, growth, and poverty reduction, it is worth pointing out there is little convincing evidence that poor countries must go through a phase of greater inequality as their economies expand (Bruno et al 1996). In view of the strong persistence of levels of inequality over time, macroeconomic policy reform would appear to have a far less important impact on long-term levels of inequality than the initial distribution of assets, including human capital, and the impact of that factor on government investment and expenditure decisions that in turn affect the future distribution of income.

This does not mean that there has been no increase in inequality in adjusting countries, however. The World Bank evaluation of adjustment lending (1995) finds that inequality, as measured by the Gini index, rose in about half of their country sample of adjustment lending and non-adjustment lending countries. Greater inequality, of course, does not imply greater poverty. The evaluation found that in most cases the growth component dominated even though in a number of countries the redistribution component was quite significant in influencing the change in the head-count index of poverty.

As noted above, a rise in inequality, even if it is accompanied by an overall reduction in the number of poor, could lead to an increased prevalence of AIDS if it increases the depth or severity of poverty and those members of the population who are adversely affected are more likely to engage in behaviour that puts them at greater risk for contracting HIV. Another channel through which increasing inequality could affect the prevalence of HIV is if greater inequality reduces educational or health services to the poor that lower their risk of infection.

Section Five: AIDS and economic growth

If the good news is that adjustment programmes are not associated with a widespread increase in poverty, the bad news is that economic growth may increase the incidence of HIV infection. The rates of HIV infection, as least in Africa and especially in the initial stages of the epidemic, have been highest among the elite, in contrast to other infectious diseases (Ainsworth and Over 1994). AIDS is not a disease primarily of the poor. It is therefore reasonable to hypothesise that policy reforms will increase the rate of GDP growth, which in turn will lead to a higher prevalence of HIV infection.

Lurie et al (1995) point out, for example, that adjustment programmes often promote indirectly and directly greater trade openness, which is accompanied by an increase in rural-urban transport infrastructure and in urbanisation associated with export-oriented industries. These factors are associated with the more rapid spread of AIDS. As Feachem et al (1995) characterise Lurie et al's argument:

'economic development is bad because it facilitates the spread of communicable disease by bringing people in closer contact with each other'.

While it is not spelled out in detail in their paper, the alternative 'development' strategy proposed by Lurie et al would likely have high costs in terms of foregone economic growth and poverty reduction. The growth literature shows convincingly that outward-oriented policies are associated with higher rates of economic growth (Dollar 1992; Sachs and Warner 1996). The more relevant question would seem to be how to harness the resources generated by economic growth and capitalise on the broad improvement in household welfare to reduce the rate of spread of HIV. Moreover, a reduction in military spending and a greater emphasis on human resource development, elements of Lurie et al's alternative development strategy, are in fact widely agreed to be an essential part of a poverty-reducing growth strategy.

Section Six: HIV, structural adjustment, and the marginalisation of women

Then there is the hypothesis that structural adjustment, by marginalising women, promotes the spread of HIV. Lugalla (1995) argues that difficult economic conditions in rural areas – aggravated by structural adjustment – force men to migrate to urban areas. Women who are left behind are poorer. The erosion of their economic power increases their dependence on their husbands' incomes and gives them less decisionmaking power in issues related to sexual relationships (with their husbands or with others) that 'render them more vulnerable to HIV transmission'. Increasing poverty in urban areas causes more women to resort to commercial sex, a 'survival strategy' that undermines their very survival. Increasing poverty is also hypothesised to result in greater undernutrition among women, reducing their immunity and causing early death from AIDS.

While the evidence does not support the view that structural adjustment is associated with poverty at the household level, this does not necessarily mean that adjustment has benefitted women either absolutely or relatively. Even if they have benefitted absolutely but not relatively to men, they could enjoy less bargaining power, which could put them at greater risk of contracting HIV infection, as Lugalla argues. Obviously this is an area in which considerably more research is needed, but also one in which it is very difficult to generate the data of the sort needed to test these hypotheses systematically.

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4

AIDS: The economic rationale for public intervention

by Michael Kremer

Section One: Market failure, equity, and the rationale for public action against AIDS

Many health professionals assume that the government should be involved in combatting the AIDS epidemic. While the case for government intervention may be clear to those in the health professions, many economists believe that too many resources have been invested in the fight against AIDS. It is useful to compare the case of AIDS with that of malaria. As *The Economist* recently noted, malaria causes three times the worldwide burden of death and disability as AIDS. Yet governments spent about US$1 billion on AIDS research in 1990 and only US$60 million on malaria research. While it may well be the case that the world should put more effort into fighting both malaria and AIDS, from the standpoint of health officials in developing countries with limited budgets, it is not clear whether more resources should be allocated to fighting AIDS.

From an economic standpoint, an argument for government intervention to fight the AIDS epidemic must have several components:

- First, an equity argument or a source of market failure must be identified. As Philipson and Posner (1993) argue, standard economic welfare analysis does not typically suggest that the government should interfere in people's decisions about what risks they wish to assume.
- Second, it must be shown that cost-effective interventions exist. Given that there is limited evidence about the effectiveness of anti-AIDS programmes, it is not clear that these programmes should be the highest priority investments for poor countries with many other problems.
- Third, even if there were a theoretical case for government intervention, and even if cost-effective interventions could be found, it must be argued that the political process could lead to these programmes actually being implemented.

This paper deals primarily with the first of these issues, arguing that even in those cases in which the risk of contracting AIDS is assumed voluntarily, there is a theoretical case for government intervention in the AIDS epidemic. Economists generally recognise the case for public subsidies for vaccination, since people who get vaccinated reduce not only their own chance of being infected, but also the chance that they will pass on the infection to others who do not voluntarily assume the risk of infection. The analysis in this paper suggests that a similar logic applies for HIV, even if the disease were transmitted only through voluntary activity. The market failures, however, and the associated policy implications are not necessarily those that one would guess from a superficial analysis of the epidemic.

Philipson and Posner (1993) argue that since sexual activity is voluntary, the government should play only a limited role in fighting AIDS. While the neoclassical welfare analysis on which their analysis is based can be criticised as an incomplete view of our social preferences, it is worth exploring this argument more fully on its own terms. As others have pointed out, there are several possible sources of externalities surrounding AIDS.

- First, some people cannot voluntarily control their risk of infection. This includes survivors of rape, minors who cannot provide consent for sexual activity, newborns, and accident victims receiving transfusions. Given that governments will not be completely effective in preventing rape and sexual exploitation of minors, however, some degree of government action is warranted to reduce HIV prevalence in the general population, so that fewer people will be involuntarily exposed to the virus.
- Second, when people choose to assume risks that increase their chance of dying, they create negative externalities for family members and others with whom they have long-term implicit or explicit contracts. Societies generally adopt some limited measures to prevent people from putting themselves at risk, such as mandating seat belt use or discouraging smoking. Similar actions against people exposing themselves to HIV may be warranted.
- Third, insofar as society pays part of the cost of treating AIDS, individuals will not fully consider the costs of becoming infected. This issue is likely to be minor in developing countries. Individuals face a huge private cost from developing AIDS, and it is likely that any financial cost borne by society is relatively minor in comparison to this private cost.

The reasons for government intervention listed above warrant some government spending to fight AIDS, but given resource constraints and the prevalence of other diseases, these reasons alone would not be sufficient to justify current levels of AIDS expenditure in developing countries.

While the choice of whether to engage in sexual activity is voluntary in the technical economic sense for the vast majority of people, it may not be voluntary in the normal sense of the word. Certain people, such as poor or married women, often have a very weak bargaining position. This is an issue of equity, not of market failure. The solution is to strengthen the bargaining position of women by increasing education and employment opportunities for women, reforming divorce laws so as to give women a greater share of households' wealth, strengthening property rights for women, and so on. Standard economic theory suggests no particular rationale for interventions directly focused on AIDS.

If one were willing to abstract from the considerations above, Philipson and Posner's argument would be correct if potential sexual partners had symmetric information about each others' sexual history. However, most sexual interactions take place under asymmetric information, and because of this, sexual behaviour will generally create externalities. The remaining sections of this paper examine the resulting externalities and the implications for policy.

- Section two argues that problems of adverse selection in private insurance markets suggest that there may be a role for government-provided social insurance to cover some of the costs associated with HIV infection. However, administrative problems with social insurance are likely to be severe in most developing countries. At a minimum, the government should prevent firms from testing employees for HIV and firing those who are HIV-positive, actions that some firms have undertaken to escape the responsibility of providing insurance for their employees.
- Section three argues that people often cannot document activities like condom use that reduce their chance of infection to future potential partners. These activities will therefore be under-provided for by the private market. This suggests a role for government encouragement of, and subsidies for, condom use, treatment for sexually transmitted diseases (STDs) that are cofactors for HIV transmission, and the use of safe blood in medical procedures.
- Section four argues that asymmetric information strengthens the case for targeting public health messages that urge reductions in the number of partners to high-activity people. This is likely to include commercial sex workers and intravenous drug users.
- Section five argues that there is a public-good case for national and international support of AIDS research and surveillance. It may make sense to buy out patents on certain AIDS drugs and allow them to be produced competitively.

Section Two: Asymmetric information, social insurance, and firm-provided insurance

It may be useful first to review the application of the economic theory of asymmetric information in the more familiar context of insurance markets for AIDS. It is well known that the market will not, in general, yield efficient outcomes if people have different costs of obtaining information – or in economic language, asymmetric information (Akerlof 1970). For example, risk-averse individuals would prefer to insure themselves against the risk of infection with HIV. If all information about other people were costlessly available, there would be insurance markets in which each individual would pay an actuarially fair premium, given his or her chance of catching the disease.

However, insurance companies can only obtain information on risk factors for AIDS at great cost, and even then, the information they obtain is likely to be worse than the information individuals have about themselves. It is therefore impossible for insurance companies to offer actuarially fair insurance rates to all people. People who know that they have a higher chance of infection than the insurance company can estimate from its information will be especially likely to participate in the insurance contract, whereas people who know that they have a lower chance will be less likely to participate. As Akerlof (1970) shows in his analysis of the market for lemons, this will typically lead some or all of the population to wind up uninsured against the risk of AIDS. This is a theoretical justification for governments to insure individuals and their families against the risk of infection. The rationale is the same as for national health insurance.

In practice, the costs of such a system have to be weighed against the benefits. In the case of AIDS, one cost of this system is moral hazard. There will be some tendency, although it likely will be quite slight, for individuals to adopt riskier behaviour if they are partially insured against the financial consequences of this behaviour. Theory suggests that in these situations it is generally optimal to provide partial insurance. Since the main costs to the individual of contracting AIDS are not financial, it is likely to be optimal to insure much of the financial cost.

In any case, the costs of administering such a system, and the fact that premiums would have to be collected through highly distortionary taxes, imply that large-scale insurance programmes are not likely to be feasible in many developing countries. Moreover, there is no reason to focus on AIDS rather than on other serious diseases.

One policy issue that has attracted attention is whether firms should be allowed to require employees to be tested for HIV and then to fire those who are HIV-positive. This question is sometimes phrased as a tradeoff between human rights and economic efficiency. In fact, there is likely to be no tradeoff. While in some cases it may be privately optimal for a company to require its employees to be tested for HIV and to fire those who are infected, it is very unlikely to be socially efficient. Formal sector companies in some countries, including the United States and many developing countries, provide insurance to their employees in order to alleviate the adverse selection problems in insurance markets. By spending money testing employees, firms often shift the burden of caring for HIV-positive people to the rest of society and away from themselves. Spending resources on HIV testing in order to create this transfer is socially inefficient and should probably be prohibited. The only exceptions would be in the rare cases in which an employee's ability to perform the job is directly harmed by being infected with HIV. Note, however, that for all the controversy that this issue has attracted, it is unlikely to be relevant for the vast majority of workers in developing countries, since they work for firms that do not provide health insurance.

The following sections apply the ideas of asymmetric information in the somewhat less familiar context of policy toward sexual behaviour.

Section Three: Policies to promote condom use, treatment for sexually transmitted diseases, and use of safe blood

When an individual takes an action that reduces his or her chances of becoming infected, but that cannot be documented to future partners, the individual creates positive externalities. Consider, for example, somebody who has a sexually transmitted disease that is a cofactor for HIV transmission. If the person has the disease treated, he/she is less likely to pass on the disease to his/her future partners. If the person's future partners cannot observe whether he/she has had his/her sexually transmitted disease treated, then the person would face too small an incentive to obtain treatment.

Moreover, consider someone who has a sexually transmitted disease and is deciding whether to be treated immediately or after a year. Even if the person's partner during the year can observe that the person has a sexually transmitted disease, there will still be a positive externality to obtaining treatment immediately. The person is less likely to become infected with HIV during the year if he/she is treated and therefore is less likely to infect new partners after the year has finished. Thus, there is a role for the government in promoting and subsidising treatment of sexually transmitted diseases. Note that this is also likely to be a cost-effective way of fighting the AIDS epidemic, in part because it automatically targets high-activity people. A similar argument indicates that the government should subsidise the provision of safe blood. It is an empirical matter whether it is cost-effective for the government to pay for blood supplies.

Note that the possibility of HIV testing does not eliminate this externality. HIV testing is costly enough in money and in psychic well-being that most people do not undertake it. Given this, people will not face correct incentives for taking actions that affect their risk of HIV infection, such as obtaining treatment for an STD or using a condom. Note also that the mere fact that people have some information about the risk of the potential partner does not necessarily reduce this externality. For example, if people use age and outward behaviour as a signal of risk, they may in fact do quite well in estimating the risk that a potential partner will be infected. However, people will still not have correct incentives to take actions, such as seeking STD treatment or using a condom, that cannot be observed by future partners.

Philipson and Posner have suggested that the cost of the AIDS epidemic is bounded by the cost of condom use, since people can protect themselves through condom use. This argument should not be taken as implying that the cost of the AIDS epidemic is low, but rather that the costs of condom use are high. Note also that this argument is not unique to AIDS. People can at least partially protect themselves against malaria by using mosquito nets treated with insecticides, yet malaria is still considered costly.

At first sight, it is not clear whether somebody who decides to insist on condom use creates a positive or a negative externality for others. If their partner does not want to use a condom, insisting on condom use could create a negative externality. On the other hand, by insisting on condom use, the person reduces the chance that the partner will become infected and this reduces the chance that *their* future partners will be infected. This creates a positive externality. (This would not be an externality if people could prove that they had used condoms in the past.)

A preliminary analysis using the standard susceptible-infective (SI) epidemiological model suggests that condom use creates large positive externalities in the steady state. In this model, the proportion of people who are infected is denoted Y and the population is normalised to 1, so that the uninfected population is 1–Y. There is a Poisson hazard rate of death, δ, which for analytic tractability (although not for realism in the case of AIDS) is taken to be constant. The transmission rate is denoted β.

Suppose that the costs of condom use is c for those who do not wish to use condoms, and that this cost is less than the cost of searching for another partner, so that those who do not wish to use a condom will agree to use one if their potential partners insist rather than searching for new partners.[1] In the model, everyone is symmetric, so the couple will use a condom if the person who wishes to use the condom has a benefit of more than c for using the condom. (It should be straightforward to extend the model to allow for the more realistic case that allows differences in bargaining power between partners.)

Suppose that all people have i partners per period, but that a proportion q insists on condom use. (For simplicity, I will assume the disease is never transmitted when condoms are used.) If people who insist on condom use match only with each other, then the decision to use condoms will not affect others' risk of infection. However, if those who would not otherwise use a condom always agree to use a condom when they meet people who insist on it, the differential equation for prevalence will be

$$\overset{c}{\dot{Y}} = (1 - q - Y)\, \beta\, i\, Y - \delta\, Y$$

since only noninfected, non-condom users are susceptible. Setting the change in prevalence equal to zero implies

$$Y^* = 1 - q - \delta/\beta i.$$

Dividing by 1–q shows steady-state prevalence among the group that does not insist on condoms is

$$1 - \delta/[\,(1 - q)\,\beta i].$$

So condom use affects prevalence in the rest of the population just as would a reduction in the transmission rate.

To see why condoms are likely to have large positive externalities in the steady state, note that if an additional 1 per cent of the population insists on condoms, those who do not insist on condoms will have to use condoms, contrary to their preferences, an additional 1 per cent of the time. They may or may not be compensated by their partners for this. On the other hand, since

$$Y^* = 1 - q - \delta/\beta i$$

steady-state prevalence in the pool of available partners will fall by 1 per cent. Thus if people are willing to trade off a 1 per cent increase in condom use against a 1 per cent reduction in the chance that they will have unprotected sex with an infected person, increases in condom use will create positive externalities in the steady state. This will be the case under the weak condition that people prefer to use condoms with those they know are infected. Although adopting condoms may create negative externalities in the short run, this analysis suggests that the long-run positive externalities are likely to be huge.

The social benefits from obtaining treatment for sexually transmitted diseases, using safe blood, or using condoms are likely to be many times the private benefit. For every case of AIDS averted among those who use a condom themselves, several additional cases may be averted among other members of the population. This suggests a strong case for government subsidies.

Section Four: The economic rationale for targeting public health messages that urge reductions in sexual activity

An analysis of asymmetric information provides an economic rationale for targeting public health messages to high-activity people that urge reductions in sexual activity. Others have argued that targeting is likely to be cost-effective (Hethcote and Yorke 1984; Over and Piot 1993). This paper reinforces the case for targeting, because it suggests that even if widely broadcast messages are no more expensive than narrowly targeted messages, targeting may lead to higher welfare and lower prevalence.

If sexual histories were publicly observable, people who had few previous sexual partners would be considered desirable partners, and in equilibrium they would either match with others who had few previous partners or with higher-risk people who provided some compensating advantage. Those with few previous partners would thus face lower costs of having additional partners. This would tend to equate private and social costs from having additional partners.

However, if people lack information about others' sexual history, negative externalities will be created by increases in activity by people with many previous partners, or by people who had not used condoms in the past or who had dangerous partners in the past. The potential partners of these high-risk people might not have agreed to have sex with them if they had known their sexual history.

Counterintuitively, reductions in activity by those with few previous partners may actually make others worse off by increasing the average probability of infection in the remaining pool of partners. For example, if the majority of the population goes to a bar and finds a sexual partner once a year, and a small minority goes 20 times a year, it might be the case that a person picked randomly from the bar would be expected to have 10 partners per year. However, if the low-activity people reduce their activity to zero, someone who picks a partner from the bar will be certain of meeting someone with 20 partners per year. Reductions in activity by low-activity people will thus create a negative externality.

While economists may judge the impact of reductions in sexual activity by the externalities they create, public health officials are likely to be concerned with their effect on prevalence. In fact, increases in the frequency of partner change by low-activity people may reduce long-run prevalence in the population as a whole (Kremer 1996; Whittaker and Rentin 1992). To see why, note that for an infectious disease to persist, each infected person must infect one new person before dying, on average. Suppose that the transmission rate for HIV were such that each infected person must have an average of 19 partners per year to infect one person before dying. If a small minority of the population had 20 partners a year, and the majority had no partners at all, the disease would persist among the active minority. If each member of the abstinent majority decided to have one partner in his or her lifetime, then the high-activity people might typically match five times a year with low-activity people and 15 times a year with other high-activity people. In this case, the disease would eventually die out because many of the new infections would occur among low-activity people who would not infect others.

Calculations using survey data on sexual activity and simple epidemiological models suggest that the example above is more than a theoretical curiosity (Kremer and Morcom 1997). More than 90 per cent of the population in a comprehensive study of sexual activity in Britain had low enough activity that reductions in activity would increase steady-state prevalence under the standard SI epidemiological model. Simulations using this simplified model suggest that if everybody who had one partner every five years reduced their frequency of partner change by 5 per cent, steady-state prevalence would increase by 7 per cent. Even if high-activity people are disproportionately likely to match with each other, reductions in activity by low-activity people are likely to create negative externalities and increase steady-state prevalence. However, for realistic parameter values, increases in activity by low-activity people could not actually eliminate the disease.

It is important to note that these results are subject to several caveats.

- First, this result should not be taken as implying that low-activity people should have more partners or should not be informed about the disease. Anyone who has more partners increases their own chance of infection, and people have a right to expect that public health authorities will truthfully inform them about health risks.

- Second, the model suggests that reductions in activity by low-activity people are only likely to increase steady-state prevalence in low-prevalence populations. Reductions in activity by low-activity people are not likely to increase prevalence in high-prevalence countries in Africa, for example.
- Third, reductions in activity by low-activity people will reduce prevalence for a short period before increasing prevalence.
- Fourth, the conclusions may be weakened by search costs in finding partners and by behavioural responses to changes in others' activity. The analysis above implicitly assumed zero search costs and used the example of a bar in which one could always find a partner.

One could also imagine a 'dating' model, in which people went on dates and decided whether to have sex, and the search costs for finding a new date were infinite. If the low-activity people decided to have sex on fewer dates, the high-activity people would automatically also have sex on fewer dates. It seems likely that many high-activity people will not continue dating without sex, but instead will seek other sexual partners.

It seems plausible that search costs are small enough that many high-activity people will respond to a potential partner's abstinence by seeking a new partner, but large enough that some of the same high-activity people will choose to comply with a potential partner's preference for condom use. As discussed below, in this case, public health messages directed to low-activity people will be more likely to reduce prevalence if they stress condom use rather than abstinence.

Although making the number of partners endogenous changes the positive analysis of the spread of the epidemic, it does not change the direction of externalities. If there are no search costs, each person's welfare depends on the probability of infection in the pool, because it is this probability of infection that determines the tradeoff between the desired number of partners and the probability of infection. Reductions in activity by low-activity people that increase prevalence in the pool of available partners will reduce others' welfare. If there are search costs, people who reduce their activity will create additional negative externalities by increasing search costs for the rest of the population.

These caveats and the extreme simplicity of the models suggest that the results discussed above should be taken as provisional. However, to the extent that the results prove robust under more complex models, they reinforce the case for targeting to high-activity people public health messages urging reductions in the frequency of partner change.

Public health messages can be targeted through their content, as well as through the choice of advertising media. For example, under theories of cognitive dissonance, messages stressing the dangers from even a single sexual encounter may have more impact on low-activity people, but messages urging people to avoid one-night stands may reduce activity among the highly active. The 'Get high, Get stupid, Get AIDS' campaign in the United States warning people about the links among substance abuse, unprotected sex, and AIDS presumably targeted high-activity people more effectively than the mass mailing of AIDS-prevention literature to all US households in the early days of the epidemic.

Note that this analysis suggests that it is likely to be particularly important to target commercial sex workers and intravenous (IV) drug users. Even though the partners of these high-risk people may know that they are engaging in a high-risk activity, *their* partners will not know this, so reducing activity among sex workers and IV drug users, therefore, creates negative externalities.

The fact that people who have many previous partners create strong negative externalities by having additional partners would theoretically suggest that these additional partnerships by high-activity people should be taxed. As Over has suggested this may mean taxing bars in some situations (Mead Over, personal communication 1997). In practice this is likely to be done most easily by taxing alcohol. This clearly creates a problem of encouraging illegal alcohol consumption, but there may be more room for increasing alcohol taxes in some countries to discourage alcohol consumption and the risky behaviour associated with it.

Section Five: Research

Just as there can be externalities between individuals within countries, there can be externalities between countries. Each country would prefer that other countries have stronger anti-AIDS policies, because this will lower infection rates and thus reduce the chance of cross-border transmission. While such externalities may be minor, the willingness of rich countries to pay for AIDS programmes in developing countries suggests that they consider it to be significant.

A more important externality may be that by conducting research on how to fight AIDS, one country may create knowledge spillovers for other countries. This suggests a strong theoretical justification for international agencies to help finance research against AIDS. In order to maximise this learning, it is important that these initiatives be carefully monitored, and this is an area in which international organisations may be able to help provide expertise and funding. Surveillance research may be conducted at the national level.

Given the monopoly price distortions created by patents, it may be useful for national governments or international organisations to buy out patents on AIDS drugs and place them in the public domain, as discussed in Kremer (1997).

The Rockefeller Foundation recently established a US$1 million prize for a diagnostic test for gonorrhoea and chlamydia suitable for use in developing countries (Rockefeller Foundation 1997). Such a test might be an appropriate place to try a patent buyout. Gonorrhoea and chlamydia are easily treated and the social value of treating these diseases far exceeds the private value, since the diseases are believed to increase the likelihood of HIV transmission three- to fivefold. Yet millions of people in developing countries go untreated because tests suitable for use in developing countries are not available.

The problem of developing a diagnostic test suitable for use in developing countries vividly illustrates the shortcomings of existing mechanisms of encouraging research. Patents could provide an incentive for developing appropriate tests. Yet monopoly prices on tests for these diseases would lead many fewer people to get tested and treated, thus leading to many more cases of HIV. The research could be contracted out, but many academic researchers are more interested in pursuing pure science than the applied problem of developing a test that can be used in tropical conditions and cheaply manufactured. Researchers awarded a grant to develop such a test might well devote time to publishing scientific papers rather than actually creating the test.

To be eligible for the Rockefeller Foundation prize, the diagnostic tests must be 99 per cent accurate, take less than 20 minutes, require no more power than can be delivered by a 9-volt battery, be storable for six months in tropical conditions, cost less than US$0.25 per device to manufacture, and be useable by health workers with primary education after two hours of training. One weakness of using a prize mechanism to encourage research is that this mechanism does not allow for tradeoffs between these criteria. For example, it might be worth accepting a device that is slightly less accurate if it was much cheaper, faster, and simpler to use. Moreover, the Rockefeller Foundation is not likely to be particularly well informed about the marginal cost of meeting the various requirements. It is possible that a test requiring 21 minutes to undertake could be developed with US$100,000 in research expenditure, but that a test that would take 19 minutes would require US$20 million of research expenditure. The Rockefeller Foundation could try to establish a complicated menu of prizes, but this would be unwieldy, and ultimately it may be preferable to let the market decide how to value the characteristics of the test.

The prize rules require that the developer of the patent provide a license to the Rockefeller Foundation. The foundation states that it will not use this license if the inventor takes steps to ensure that the device is made available to developing countries at a price no more than 10 per cent above manufacturing and distribution costs. The Rockefeller prize will therefore provide no additional incentive for invention if the monopoly value of the patent would be greater than US$1 million plus the profits that could be made by selling the invention at 10 per cent above production costs.

Perhaps the Rockefeller Foundation should consider announcing that if the prize has not been claimed by March 1, 1999, the date the prize expires, it would consider using the funds for a patent buyout. The foundation might want to buy only part of the patent rights, given the limited funds at its disposal. For example, the foundation might buy out the last 10 years of the patent, so as to leave the inventor with an incentive to market the test for the first several years.

An announcement that the foundation would consider a patent buyout if the prize had not been awarded by March 1, 1999, might cause inventors to slacken their effort to meet the requirements of the prize, but this seems unlikely because any inventor who did this would run the risk that another researcher would claim the prize.

Section Six: Concluding remarks

The analysis above has examined the market failures surrounding AIDS. However, an analysis of public policy must also consider the cost-effectiveness of various policies and the political constraints surrounding their acceptance and implementation. In large part these are empirical questions, and they will vary considerably from country to country. Table 1 summarises some of the policy issues surrounding AIDS. Note that standard economic theory suggests that public subsidies should depend on externalities, not cost-benefit analysis. For example, suppose that by providing free treatment for one person for a sexually transmitted disease, it is possible to reduce that person's chance of infection by 20 per cent, and this produces an average reduction of one infection in the rest of the population. In this case, the treatment should be subsidised to reflect the benefits to society of preventing infection of the additional person, not the person who has the sexually transmitted disease. Under a neoclassical analysis, that person would appropriately decide whether to obtain treatment based on its private costs and benefits.

Any expenditures on AIDS should be compared for cost-effectiveness against other health expenditures. In developing countries, there are likely to be many other pressing needs, such as immunisation for childhood diseases, that are likely to be extremely cost-effective and for which there is a strong economic rationale in terms of welfare analysis. However, from the standpoint of an individual developing country, the availability of subsidies from international organisations and from rich countries to fight AIDS suggests that the cost-benefit threshold for approving anti-AIDS projects may be lower than that for other diseases, such as malaria.

It is difficult to assess the cost-effectiveness of anti-AIDS efforts, because it is difficult to estimate the number of additional infections due to each primary case and because it is very difficult to know how behaviour responds to such interventions as promotion of condoms. While economic analysis can show the theoretical usefulness of interventions, it is very difficult to be confident in judgments about whether we are spending too much or too little on particular interventions. The data are simply not available.

It is also important to note that there is little agreement on the philosophical basis for the economic welfare analysis carried out in this paper. Most doctors and philosophers would see the welfare analytical framework used here as failing to incorporate fully social objectives. They would feel that governments should either prohibit people from voluntarily subjecting themselves to a large risk of death or spend lots of resources to convince them not to do so. This is a philosophical issue beyond the reach of economics, but it would be a mistake to reject these views out of hand, merely because they are not consistent with the familiar framework of welfare economics.

Table 1. Market failures and policy implications

Market failure	Policy	Potential problems
Adverse selection in insurance markets	Provide social insurance for AIDS victims and families	Corruption, administrative costs, distortionary taxation, moral hazard
	Prohibit formal sector firms from firing HIV-positive employees	Very few, except in sectors in which HIV status could affect ability to perform job
Activities that reduce the chance of infection are difficult to document to future partners	Target to high-activity people public health messages urging reduced activity	
	Tax alcohol	Illegal substitutes
	Encourage and subsidise condom use	
	Subsidise treatment of other sexually transmitted diseases	
Public good nature of research	National and international government finance of AIDS research	Share of research budgets devoted to AIDS may already be higher than is cost-effective
	Buy out patents on AIDS drugs/ diagnostic tests	Administrative problems, collusion among drug companies
Involuntary exposure to AIDS	Laws against rape, exploitation of minors	
Equity problems		
Low status of women worsens bargaining position	Create educational and job opportunities for women, improve property rights, improve rights under divorce proceedings	

Note

1 Imagine that there is a distribution of costs and benefits of using a condom, and that the couple uses a condom if the benefits, weighted by the bargaining power of the partners, outweigh the costs. Consider the example of someone who switches from being neutral about condom use to having such a strong preference that he or she insists on condom use.

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5

International law and the rights of people living with HIV/AIDS

by Hnin Hnin Pyne

Section One: Introduction

Prior to the HIV/AIDS epidemic, the link between health policies and human rights was rarely drawn. Indeed, public health, which traditionally has employed measures that can be coercive, compulsory, and restrictive, has often been considered as one of the legitimate grounds for restricting human rights (Gruskin et al 1996; Mann et al 1992). The HIV/AIDS epidemic heightened the need to explore the nexus between health policies and human rights, because the common initial response to the epidemic – very much in the tradition of public health in tackling a communicable disease – imposed coercive measures, such as identifying infected individuals who were then labelled as carriers and subjected to isolation and quarantine.

The disease also quickly became associated with certain population groups, such as homosexuals, commercial sex workers, refugees, or migrant workers, who in most cases already are marginalised within society. Blame and fear spurred many of the initial HIV policies and interventions. Groups that often lacked a voice in the political and policymaking realm became easy targets for coercive and restrictive measures. This phenomenon precipitated the mobilisation of human rights groups and activists who questioned the effectiveness of such measures and sought to find alternative means of containing the spread of HIV. The early stage of the epidemic was characterised by confrontation between the public health and human rights communities.

The relationship between human rights and HIV/AIDS, however, has evolved in the last two decades. By the late 1980s, the World Health Organisation (WHO) began to adopt a policy that respects and promotes human rights as an integral component of HIV prevention. It began to espouse a view that discriminating against people living with HIV/AIDS (PLWHA) and blaming certain population groups as 'vectors' of the virus are counterproductive to prevention and mitigation efforts by driving the epidemic underground.

Stigmatisation and discrimination discourage those who are most affected and vulnerable from seeking assistance from health and social services.

Coercive measures, such as mandatory testing, breaches of confidentiality, and forcible segregation, will further reinforce the resistance to acquiring help and impede outreach and education efforts.

Discrimination is counterproductive to HIV prevention

The following are examples of how discrimination impedes efforts to curb the spread of HIV, as it drives the epidemic underground.

Illinois, USA: when Illinois introduced mandatory reporting and contact tracing of HIV/AIDS cases, the percentage of those not appearing for appointments to be tested at Chicago's two city test centres rose from 34 per cent in April to 41 per cent in May to 46 per cent in June (*Chicago Tribune,* August 5, 1987, cited in Cohen and Wiseberg 1991).

Germany: when the state government of Bavaria required mandatory testing of prostitutes and drug users, many of them moved out of the state to avoid the test, whereas others dropped out of research projects, causing the projects to close (World AIDS, May 1989, cited in Cohen and Wiseberg 1990).

Australia: legislation proposed in 1985 by the minister of health, which mandated reporting of HIV-positive test results and criminalised sexual relations with people infected with HIV (unless the partner was notified prior to the relation), led to an immediate drop in requests for HIV tests by 40 per cent from August to September (University of New South Wales, cited in Cohen and Wiseberg 1990).

Section Two: Human rights in the context of HIV/AIDS

2.1 International law

The Universal Declaration of Human Rights, drafted by the United Nations in 1945, inspired numerous international, regional, and subject-specific conventions, which serve as a foundation for modern international human rights law (Cook 1995). The International Covenant on Civil and Political Rights; the International Covenant on Economic, Social, and Cultural Rights; the African Charter on Human and People's Rights; and the Convention on the Elimination of All Forms of Discrimination Against Women are a few of the legal instruments that provide a set of human rights principles that now have come to be considered as international customary law (Cook 1995). The modern legal order requires governments to respect international customary law in their international and domestic affairs as a condition of their legitimacy as governments (Cook 1995).

The community of nations has committed itself to the notion that sovereignty does not give governments or national leaders the authority to mistreat their citizens. There are a number of limits on the authority of the state, and there are rights that are so fundamental that they cannot be given or taken away by any government or individual. They exist not as a consequence of our citizenship, but of our humanity (Whelen 1993).

In the area of human rights, the law has identified certain principles, or peremptory norms of conduct, from which no divergence is permitted. A nation may, therefore, be held to be in breach of inviolable standards of customary international law, if it practises, encourages, or condones:

- genocide
- slavery or slave trade
- the murder or causing the disappearance of individuals
- torture or other cruel, inhuman, or degrading treatment or punishment
- prolonged arbitrary detention
- systematic racial discrimination

(restatement [Third] of the Foreign Relation Law of the US, Section 702 a–f, Reporter's Note 12, 1987, cited in Ragland 1994).

Various other acts breach customary law if perpetrated regularly and in accordance with state policy. A country also, therefore, violates international law if it practices, encourages, or condones:

- a consistent pattern of gross violations of internationally recognised human rights (this refers to violations of those rights that are universally accepted and that no government would admit to violating as state policy). An abuse not defined gross will be deemed as such if it is carried out as part of a consistent pattern, i.e., systematic harassment, invasions of the privacy of the home, denial of the right to return to one's country, mass uprooting of a country's population, denial of freedom of conscience and religion, and invidious racial or religious discrimination (Ragland 1994).

It is important to note that the international human rights covenants, although legally binding, are not self-executing. This means that each state must enact domestic enabling laws in order to actualise the human rights principles. The key conventions, such as the Political Covenant, entail the establishment of committees responsible for monitoring compliance by states that have ratified these conventions. Some committees require governments to provide periodic reports, whereas others receive and investigate human rights violations alleged by individuals against the state (Cook 1995). The principal concern of human rights law is this relationship between the individual and the state.

Existing legal treaties and customary law therefore ensure the protection of the human rights of PLWHA and others tackling the HIV/AIDS epidemic and provide a strong foundation for these rights that is secured by, among others, the principles of nondiscrimination, right to privacy, right to liberty and security, right to marry and found a family, and freedom of movement.

It is important to recognise that public health is one of the legitimate grounds for infringement of the rights of individuals (others include national security and public order and morality). However, public health may only serve as a justification when the impediments placed on human rights:

- are conducted in accordance with the law
- serve the interest of a legitimate objective of general interest
- are carried out in the absence of an appropriate alternative (a less intrusive means) to reach the same goal
- are not imposed arbitrarily or discriminatorily (Gruskin et al 1996; UNHCR 1994).

2.2 HIV/AIDS and human rights organisations

Human rights violations often are reported to intergovernmental agencies by individuals and national or international nongovernmental organisations (NGOs) (Gruskin et al 1996). Major international human rights organisations have only recently begun to address HIV/AIDS-related human rights abuses. One reason is that the organisational mandate of such groups as Human Rights Watch and Amnesty International requires that they work within the framework of political and civil rights and concentrate primarily on negative rights – i.e., calling upon states to cease violations and enforce domestic laws that prevent or prohibit violations committed by citizens.

Health traditionally is omitted from their mandate, as it falls primarily within the domain of economic, social, and cultural rights, and is considered a positive right. Since the early 1990s, however, human rights organisations have begun to explore means of incorporating HIV/AIDS into their work. For example, Amnesty International studied AIDS service organisations to determine under what circumstances HIV/AIDS issues can fall within its mandate. Human Rights Watch's documentation on trafficking of Burmese and Nepali girls and women into the brothels of Thailand and India, respectively, has successfully placed HIV/AIDS-related violations within the context of political and civil rights (Human Rights Watch 1992, 1994).

Trafficking of Burmese women and girls into brothels in Thailand

HIV testing is frequently imposed on Burmese girls and women in the sex industry on a mandatory basis without informed consent. Testing occurs in brothels and in detention ('immigration jails'), and is reported by the Burmese military junta after the women are deported. Mandatory testing without informed consent is explicitly prohibited by both WHO Guidelines and the Thai National AIDS Plan. This intervention violates the individual's basic right to privacy. The right to privacy can be justifiably disregarded by governments for the greater good of protecting public health, provided the stringent conditions are met. But mandatory testing of Burmese girls and women does not meet these conditions, notably:

1 Thai law does not allow mandatory testing of commercial sex workers.

2 There appears to be a consensus among public health experts – e.g., at the WHO – that mandatory testing is not an effective means for slowing the spread of infection, especially for these women, whose knowledge of their status has no remedial value, as they are subjected to slave-like conditions.

3 Other alternative measures, such as prosecuting trafficking agents and brothel owners and promoting targeted education in the Burmese language, have not been employed.

Source: Human Rights Watch 1992.

Human rights organisations, such as Amnesty International (cited in Mann et al 1992) and Human Rights Watch (personal communication with the director of the Women's Rights Project, June 1996), have expressed great resistance to ranking countries by human rights criteria. One reason is that the availability of information on human rights abuses is associated negatively with the seriousness of the problem. For example, countries that have formal channels to report allegations of human rights violations are in fact places where there is openness to discuss human rights issues and to incorporate principles of protection into HIV/AIDS work (Mann et al 1992). A second reason is that the number of complaints has been limited. This could result from a lack of clear articulation of human rights norms, and these norms may be unfamiliar to both the victim and the violator (Mann et al 1992). There is at present a lack of systematic monitoring and worldwide assessment of HIV/AIDS-related human rights violations (UNCHR 1994).

Section Three: Analysis of the findings of the *AIDS in the World* human rights survey

The objective of this section is to discuss the findings from a survey of national AIDS programmes conducted for the second volume of *AIDS in the World*. The survey inquired about the laws and practices that protect and violate human rights related to HIV/AIDS in countries worldwide. The questionnaire was sent to 187 countries, of which 118 responded. The focus being low- and middle-income countries, the analysis included only 93 respondents. It addressed the following areas of concern:

- monitoring mechanisms
- restrictions based on HIV status (law and practice)
- reports on allegations of human rights violations related to HIV/AIDS
- obligatory testing
- restrictions on entry to the country.

This section examines HIV/AIDS-related human rights laws and practices that were in existence at the time of the survey from December 1993 to June 1994.

3.1 Monitoring mechanisms

Two survey questions address the issue of monitoring human rights violations. One seeks to determine the existence of a mechanism within the national AIDS programme, and the other explores the existence of organisations outside the governmental structure that act as monitors. Eighty-six countries (92.5 per cent) responded to the first question, 34 per cent of which had established a mechanism within the governmental structure to receive and pursue allegations of human rights abuses (the specifics were not included, such as the capability to investigate, to work with other agencies – i.e., law enforcement). About half of the countries (49 per cent) reported having an organisation or group outside the government that documents and monitors HIV/AIDS-related human rights abuses.

3.2 Restrictions based on HIV status

Marriage

'The right of men and women of marriageable age to marry and to found a family shall be recognised'. (International Covenant on Civil and Political Rights, Article 23, in UN 1988)

Mandatory premarital HIV testing, coupled with the denial of a marriage licence to those infected with HIV and prohibiting the marriage of individuals known or suspected to be HIV-infected, interferes with the right to marry and found a family (UNCHR 1994). A public health rationale does not provide sufficient justification for violating this right, because such a restriction does not serve as an effective means of preventing either sexual or perinatal transmission of HIV. Extramarital and premarital sexual activity are common.

Only three respondents (4 per cent) reported that in practice PLWHA were prohibited from marrying, whereas five reported the existence of a law dictating this practice. For example, in Colombia, Moldova, and St. Lucia, the law prohibiting marriage of PLWHA was not enforced. In Oman, this type of restriction took place without the existence of a law. Panama and Peru prohibited those who are infected with HIV from marrying, both in law and in practice.

Sex work

About the same number of countries in practice and in law (12 per cent of those which responded to the question) imposed restrictions on commercial sex workers who are infected with the AIDS virus. Colombia and St. Lucia did not enforce a law that restricts prostitutes based on their HIV status. On the other hand, Belize, Mexico, Peru, and Brunei did prohibit PLWHA from commercial sex work without the existence of law supporting this practice. Ecuador, Panama, Jamaica, Moldova, Jordan, and Malaysia had enacted legislation that is also actively pursued. The nature of the restriction – license revocation or confinement – was not addressed by the survey. It is also unclear how these restrictions are actually enforced.

Freedom of movement (segregation)

'Everyone has the right to liberty and security of person. No one shall be subjected to arbitrary arrest or detention. No one shall be deprived of his liberty except on such grounds and in accordance with such procedure as are established by law'. (International Covenant on Civil and Political Rights, Article 9, in UN 1988)

Public health has provided a legitimate ground for depriving an individual of liberty, for example, through measures of compulsory quarantine or internment, commonly employed in cases of communicable diseases. However, such measures need to satisfy conditions to ensure that they are not arbitrarily imposed, but are taken on reasonable grounds and in accordance with a procedure established by law (UNCHR 1994). The government would have to establish a case that the individual who has been detained indeed has the infection and that the detention is essential for preventing the spread of the virus. In th case of HIV/AIDS, the WHO recommends 'that persons suspected or known to be HIV-infected should remain integrated within society to the maximum possible extent and be helped to assume responsibility for preventing HIV transmission to others' (UNCHR 1994).

In eight countries (9 per cent), PLWHA were admitted into special centres, whereas 11 countries had laws that prescribe compulsory confinement or quarantine of infected people. Where laws existed restricting freedom of movement of PLWHA, some countries, such as Azerbaijan, Algeria, the Kyrgyz Republic, Turkmenistan, and Malaysia, did enforce them. Others, such as Costa Rica, Senegal, Russia, Jordan, and Syria, did not. In Venezuela and Mali, confinement and restrictions were practised without the presence of supporting legislation. The survey did not ask for the duration or nature of the confinement.

Examples of quarantine and isolation policies

Romania: a law was passed in 1987 that called for mandatory hospitalisation of anyone having AIDS or suspected of having AIDS.

South Korea: the minister of health was given authority to isolate people with HIV in 'protected establishments'.

Pakistan: in 1988 a housemaid was sentenced to a three-month detention in an isolation ward in a maximum security prison hospital. The condition of her release was that she would be quarantined in a public hospital.

India: the 1987 Goa Public Health Act mandated detention of HIV-positive people. Four people were arrested and kept in the TB sanatorium for two years. They were released after the mandatory provisions of the law were changed.

Source: Tomosevski 1992; Whelen 1993.

3.3 HIV/AIDS human rights violations

The survey examined six different types of human rights violations:

- mandatory testing
- breach of confidentiality
- discrimination at workplace *and* school
- discrimination in housing
- discrimination by health services.

The human rights abuses discussed in this section predominantly involve violations of the right to privacy and of the principle of nondiscrimination.

Mandatory testing and breach of confidentiality

'No one shall be subjected to arbitrary or unlawful interference with his privacy, family, home or correspondence, nor to unlawful attacks on his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks'. (International Covenant on Civil and Political Rights, Article 17, and Universal Declaration of Human Rights, Article 12, in UN 1988)

Public health can be employed as a justification for interfering with the right to privacy only if stringent conditions, mentioned above, are met. In this case, the United Nations Commission on Human Rights and the WHO uphold the view that not only do coercive measures, such as mandatory testing, not meet the conditions, but they may actually hinder HIV prevention and mitigation efforts.

The Case of Cuba

In 1987 Cuba launched a systematic HIV screening of its entire population and established 13 sanatoriums for those who are found HIV-positive. Once tested positive, the person must move to one of the sanatoriums.

Cuba received much attention from the international community not only because it was placing people in isolation and under surveillance, but also because it provided them with the medical services and lifestyle that are generally better than that of the general public. The residents of the sanatorium are paid 100 per cent of their salaries, guaranteed a high-protein diet, and transferred to a hospital when they have progressed to AIDS and receive treatment there.

They are permitted to leave the sanatorium grounds one day a week within a specified time. After six months, if they are deemed responsible, they are allowed to leave for the weekend without company. Sexual activity is permitted and condoms are made available.

Cuba is a unique case. Its policies provoked heated discussions and tensions within the public health and human rights communities. While some

human rights groups decried the initiative, others noted that the Cuban government is not violating human rights law, because it is fulfilling the responsibility of respecting the dignity of PLWHA by providing humane living conditions and health care.
Source: Bayer and Healton, and Johnson, cited in Whelen 1993.

Discrimination

'Everyone is entitled to all the rights and freedoms set forth in the Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status'. (Universal Declaration of Human Rights, Article 2, in UN 1988)

Although HIV/AIDS status is not explicitly included in the universally recognised nondiscrimination principle, the Sub-Commission on Prevention of Discrimination and Protection of Minorities claimed that

'discrimination on the basis of AIDS or HIV status, actual or presumed, is prohibited by existing international human rights standards and the term "or other status" in non-discrimination provisions of international human rights texts should be interpreted to cover health status, including HIV/AIDS'. (UNCHR 1994, 7)

Although only 12 countries answered the question on 'Other', it is worthwhile to mention a few of the other problems faced by PLWHA. The Brazilian national AIDS programme received reports that HIV-positive persons were being denied religious services, and the Mexican programme received reports of refusals to bury people who had or were suspected to have died of AIDS. (The Syrian Arab Republic answered this question in the survey as 'rights never violated; protected by law'.)

3.4 Mandatory/compulsory testing of population groups

Obligatory testing can either be mandatory or compulsory. Under compulsory testing, an individual or groups may not refuse the procedure, which is upheld by law or national policy. Consent is not obtained nor required by compulsory testing (Panos 1990). This method is often employed to test 'captive populations', such as refugees, prisoners, and soldiers (Whelen 1993). Mandatory testing, on the other hand, serves as a means for determining whether an individual should be allowed access to benefits, such as scholarship, employment, and travel. A positive test result, as well as the refusal to be tested, generally leads to denial of the benefits sought by the individual (Panos 1990). Whelen (1993) cited the following reasons for the Global Programme on AIDS' opposition to mandatory testing and its contention that it is deleterious to public health.

1. People who believe they may be infected by HIV will go 'underground' to avoid mandatory testing, because of the discrimination and stigmatisation that is associated with HIV/AIDS. They will not use the health care system and other services that can provide them with information and education about HIV.
2. Testing without informed consent and breach of confidentiality destroy the credibility of health care workers.
3. Not all HIV-positive people can be identified because of the window period and problems associated with false positive and negative results.
4. Mandatory testing will give people a false sense of security.
5. The high cost of mandatory testing programmes will divert resources from much needed and more effective prevention measures.

The survey identified 11 groups that often are subjected to compulsory/mandatory HIV testing:

- sex workers
- gay men
- pregnant women
- prisoners
- health care workers
- TB patients
- military recruits
- applicants for certain jobs
- citizens applying for school fellowships
- blood donors
- people getting married.

Again, it distinguishes between practice and law in carrying out these obligatory testing procedures. The finding indicates that, across all groups, the proportion of countries conducting obligatory testing is higher in practice than in law. For example, 39 per cent of the countries (respondents) imposed obligatory testing on all military recruits, but only 14 per cent of the countries had legislation that mandated this intervention.

3.5 Obligatory testing of migrants and travellers

'Everyone has the right to freedom of movement and residence within the borders of each State. Everyone has the right to leave any country, including his own and to return to his country'. (Universal Declaration of Human Rights, Article 13, in UN 1998)

Mahal (1995) indicates that a public health rationale is the most commonly cited justification for barring travellers with contagious conditions, including HIV/AIDS, from entry into other countries (other rationales include public safety/order and economic burden). In international law, the right to enter a country is confined to the nationals of the country. States do not have an obligation to approve entry for foreigners (migrants or travellers).

But for nationals, the right to enter is absolute and is not subject to any restriction, and so states cannot legitimately subject national returnees to HIV testing as a condition of reentering the country (UNCHR 1994).

Testing of foreigners for HIV infection can be imposed only in cases where the state can establish an argument that this testing would help protect the health of the public. The WHO has stated that excluding foreigners and travellers will not prevent the introduction and spread of HIV, as the virus is already present in every country in the world (UNCHR 1994).

The survey selected seven groups of migrants and travellers:

- national returnees
- immigrants
- tourists
- permanent residence applicants
- foreign labourers
- foreign students
- asylum applicants.

National returnees

Azerbaijan, Moldova, and Syria required testing of their citizens returning from abroad. The Kyrgyz Republic, Turkmenistan, and Ukraine carried out obligatory testing without legislation. Russia, on the other hand, had a law that prescribed obligatory testing but indicated that this was not enforced.

Immigrants

Seven countries (Argentina, Bulgaria, Jordan, the Kyrgyz Republic, Panama, Russia, and Turkmenistan) indicated a positive response to obligatory testing of all immigrants, both in law and practice. El Salvador and Ethiopia employed this practice despite the absence of a law.

Tourists

China and the Kyrgryz Republic carried out testing of tourists with legislative support. Moldova indicated that testing occurred but did not indicate the legal foundation.

Permanent residence applicants

Argentina, Benin, Bulgaria, the Kyrgyz Republic, Lithuania, Panama, Russia, and Turkmenistan required all applicants for permanent residence to undergo a test for HIV, which was endorsed by legislation. El Salvador did so without any law.

Foreign labourers

Eleven countries (Bulgaria, China, Jordan, the Krygyz Republic, Kuwait, Malaysia, Oman, Panama, Russia, Turkmenistan, and Ukraine) practised obligatory testing of foreign labourers with legislative support, whereas

Brunei, Lebanon, and St. Lucia carried out tests without legal foundation. A law existed in Israel but was not enforced. Azerbaijan, Belize, Mauritius, and Moldova conducted testing of foreign labourers, but did not refer to any legal foundation for the practice.

Foreign students

Obligatory testing of foreign students was carried out and supported by legislation in eight countries (Bulgaria, China, Jordan, the Krygyz Republic, Kuwait, Russia, Turkmenistan, and Ukraine). Although Croatia had a law that mandated testing of this particular population group, it did not respond to the question about enforcement of this law. Azerbaijan, Belarus, Moldova, and Syria conducted testing.

Asylum applicants

Only three countries (Bulgaria, Russia, and Turkmenistan) practiced obligatory testing of asylum applicants with a legal foundation. Belize and Moldova indicated a practice of this form of testing, but not a law.

3.6 Restriction of entry into the country based on HIV status

The survey selected four different groups of HIV-positive migrants and travellers:

- short term
- long term
- asylum seekers
- refugees.

Once again, the question distinguished between law and practice.

Short term

Eight countries (9 per cent) imposed restrictions on short-term HIV-positive travellers in practice, whereas six countries did so only in law. The Kyrgyz Republic, Kuwait, Malaysia, Oman, and Turkmenistan restricted entry both in practice and in law. Brunei prohibited this group from entering the country without legislative support, whereas Micronesia had a law that was not enforced. Moldova and Syria did not indicate an answer for the legal question but acknowledged carrying out this form of restriction in practice.

Long term

Fourteen countries gave a positive response to the question about prohibiting entry of HIV-infected long-term travellers, while 10 countries have the legal foundation to do so. Jordan, the Kyrgyz Republic, Kuwait, Malaysia, Micronesia, Oman, Panama, Russia, and Turkmenistan bar entry to this group of travellers, and this policy is supported by a law. Bulgaria, Moldova, and Syria disregarded the legal question but provided a positive response to the practice of barring. Israel, on the other hand, does not enforce its law.

Asylum seekers

Eight countries (9 per cent) stated that they prevent HIV-positive asylum seekers from entering the country in practice, but only three had legislation requiring this restriction. Countries that both in practice and in law prohibited this group of PLWHA included the Kyrgyz Republic, Malaysia, and Turkmenistan. Brunei did not have a legal foundation for such a restriction, but it was imposed. Bulgaria, Guatemala, Moldova, and Syria gave no response to the legal question, but stated that in practice they barred entry.

Refugees

Eight per cent of the countries that responded to the question banned entry of HIV-positive refugees into the country, whereas 5 per cent indicated that they had laws that mandate this form of restriction. Estonia, the Kyrgyz Republic, Malaysia, and Turkmenistan enforced laws that restrict entry of refugees who are infected with HIV. Although they disregarded the legal question, Bulgaria, Moldova, and Syria gave a positive response to the question of imposing barriers to entry. Brunei restricted HIV-positive refugees from entering without legislative support.

Section Four: Conclusion – continuing needs in human rights and AIDS

Human rights remain a contentious issue in many parts of the world. They have often been framed as an 'East-West' debate, where issues of sovereignty and cultural relativism come into play. However, there is a great need not only to monitor human rights abuses against people living with HIV/AIDS, but also to continue the process of documenting if and/or how infringements on human rights may increase vulnerability to HIV infection.

It would also be a contribution to the area of human rights and HIV to compile lessons learned and the best practices of those governments that have managed to curb the spread of HIV within their countries and at the same time respected the rights of infected individuals.

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Part II

HIV Prevention Policies and the Socioeconomic Determinants of Infection

6

Who is most likely to die of AIDS? Socioeconomic correlates of adult deaths in Kagera Region, Tanzania

by Martha Ainsworth and Innocent Semali[1]

Section One: Introduction

This paper compares the socioeconomic characteristics of the adults who died from AIDS and those who died of other causes among a stratified random sample of more than 800 households in the Kagera Region of Tanzania, interviewed from 1991 to 1994. Why should analysts and policymakers be concerned about the characteristics of those who are infected?

- First, information on the observable characteristics of those most likely to be infected can improve the targeting and effectiveness of prevention activities.
- Second, the background characteristics of those infected with HIV affect the economic impact of the AIDS epidemic on households and the economy, including the distribution of skills in the labour force and the demand and ability to pay for curative medical care.
- The socioeconomic characteristics of individuals who are infected with HIV and who die from AIDS are also important in developing programmes to assist households and communities in coping with the epidemic.

Section Two: The relation between HIV infection and socioeconomic status

Poverty and illiteracy might be expected to raise the probability of infection of sexually transmitted diseases, since people with low incomes may be less able to afford condoms or STD treatment and those with little education may have less access to information about the dangers of high-risk behaviour or may be less able to understand prevention messages. This explains why, for most STDs, the poor and uneducated have higher infection rates (Lacey and others 1997). This also appears currently to be the case for the spread of HIV in industrialised countries (Cowan and others 1994; Krueger and others 1990; McCoy and others 1996). However, at least in the first decade of the HIV/AIDS epidemic in Africa, HIV infection did not follow this pattern. Many studies, most of them from Central and Eastern Africa in the late 1980s and early 1990s, show a positive correlation between HIV infection and socioeconomic status, as measured by schooling, income, or occupation (table 1).

What accounts for the fact that people of higher socioeconomic status are more likely to be infected? Analysis of data from Demographic and Health Surveys (DHS) from the early 1990s and surveys of sexual behaviour sponsored by the WHO Global Programme on AIDS (GPA) conducted in 1989–91 reveals that the probability of having a nonregular sexual partner (or commercial partner, in the WHO/GPA data) rises with education, potentially raising their exposure to contracting STDs, including HIV (Filmer 1998; Deheneffe and others 1998, both in this volume). While none of these surveys measured income, it is reasonable to expect that the demand for commercial sex and/or the ability to support multiple partners would rise with income. Further, men and women with more education and higher incomes are probably more likely to travel and thus have more opportunities for casual sexual contacts.

Early in the HIV epidemic it was not known how HIV was spread, and knowledge of and access to means of prevention, such as condoms, was low. Thus, we might expect that a disproportionate share of people infected early in the epidemic had higher education and income. Since HIV has a long asymptomatic period and cannot be cured, current patterns of infection are likely to reflect the correlates of new infections in the past.

However, as HIV/AIDS becomes an endemic disease in many African countries, the positive relationship between economic status and HIV infection may disappear; the more educated may have greater access to information on how HIV is spread and may be more able to act on this information. The DHS and WHO/GPA data show, for example, that in virtually every country studied, those with more education are more likely to use a condom in casual and commercial sex (Filmer 1998; Deheneffe and others 1998). Limited evidence on the characteristics of those with incident (new) HIV infection indicates that a shift in the pattern of infection to those with lower socioeconomic status is already under way in some countries.

A study of urban areas of Butare, Rwanda, found that HIV incidence was lower among women in low-income households (Bulterys and others 1994). In Thailand in the early 1990s, HIV incidence was lower among 21-year-old military conscripts with more education (Carr and others 1994). In Brazil, there has been a shift in the socioeconomic distribution of AIDS cases: in the early 1980s, three-quarters of those newly diagnosed with AIDS had a secondary or university education; by the early 1990s this share had fallen to a third (Parker 1996). The analysis below will establish whether such a shift has occurred in the Kagera Region of Tanzania.

Table 1. Studies showing a positive relation between socioeconomic status and HIV infection in sub-Saharan Africa

Measure of socioeconomic status and study	Location of study	Year of data	Sample
Schooling			
Allen and others 1991	Kigali, Rwanda	1988	Women attending outpatient and prenatal clinics[a]
Barongo and others 1992	Mwanza Region, Tanzania	1990–91	Population-based[b]
Dallabetta and others 1993	Malawi	1989–90	Pregnant women[a]
Grosskurth and others 1995	Mwanza Region, Tanzania	1991–92	Population-based[b]
Kirunga and Ntozi 1997	Rakai District, Uganda	1992	Population-based[b]
Menon and others 1996	Rakai District, Uganda	1989–90	Household heads[b]
Msamanga and others 1996	Dar es Salaam, Tanzania	1995–96	Pregnant women[a]
Serwadda and others 1992	Rakai District, Uganda	1989	Population-based[a]
Wannan and others 1997	Northeastern Zaire	1990–91	Pregnant women[b]
Income or wealth			
Allen and others 1991	Kigali, Rwanda	1988	Women attending outpatient and prenatal clinics[a]
Kirunga and Ntozi 1997	Rakai District, Uganda	1992	Population-based[c]
Menon and others 1996	Rakai District, Uganda	1989–90	Household heads[c]
Msamanga and others 1996	Dar es Salaam, Tanzania	1995–96	Pregnant women[b]
Ryder and others 1990	Kinshasa, Zaire	1987–88	Workers in two firms[b]
Occupation			
Allen and others 1991	Kigali, Rwanda	1988	Women attending outpatient and prenatal clinics[a]
Armstrong 1995	Uganda (national)	1988	Men in national HIV seroprevalence survey[b]
Barongo and others 1992	Mwanza Region, Tanzania	1990–91	Women in population-based sample[b]
Kirunga and Ntozi 1997	Rakai District, Uganda	1992	Population-based[b]
Ryder and others 1990	Kinshasa, Zaire	1987–88	Workers in two firms[b]
Serwadda and others 1992	Rakai District, Uganda	1989	Population-based[b]

Note: Unless otherwise indicated, results are from both male and female adults.

a. Partner's socioeconomic status related to own HIV status.

b. Own socioeconomic status related to own HIV status.

c. Household income or wealth related to own HIV status.

Section Three: The setting and the data

At the time of the 1988 Tanzanian Census, more than 1.3 million people lived in the Kagera Region, located on a plateau on the western shore of Lake Victoria. Kagera borders the Rakai district of Uganda to the north, Rwanda and Burundi to the west, and Mwanza, Shinyanga, and Kigoma Regions of Tanzania to the south. More than 80 per cent of the population lives in rural areas. Most of the population is engaged in agriculture – tree crops in the north (bananas, coffee) and annual crops and livestock in the south. Because of the early presence of missionaries around Lake Victoria, it is believed that levels of education in Kagera may be higher than in other regions of Tanzania. Household consumption expenditure in Kagera in 1991 was US$217 per capita, based on the data set used in this study, ranging from US$118 to US$357 across the six districts in the region.

Kagera is at the epicentre of the African AIDS epidemic. The first case of AIDS in the region was diagnosed in 1983, although HIV was most likely present at least a decade earlier. A population-based seroprevalence survey conducted in 1987 found that about one in four adults in the regional capital (Bukoba) was infected with HIV, but that one in 10 adults in rural areas surrounding Bukoba was also infected (Killewo and others 1990). In the rural south and southwest of Kagera, in contrast, fewer than 1 per cent of adults were infected; to the west the adult infection rate was 5 per cent.

Kagera is at a crossroads for people and goods moving across international borders and along the lake. The spread of HIV was no doubt accelerated by the 1979 war with Uganda, involving a large influx of Tanzanian and Ugandan soldiers. More recently, the population of Kagera has been swollen by perhaps half a million Rwandan refugees. The dense refugee settlements facilitate spread of HIV among their inhabitants and to the local rural populations.

The data used in this paper come from the Kagera Health and Development Survey (KHDS), a longitudinal survey conducted from 1991 to 1994 of more than 800 households from the entire region (Over and Ainsworth 1989; Ainsworth and others 1992). Household members were defined as persons who had lived in the same dwelling and shared meals for at least three of the past 12 months or, if they recently joined, as persons who intended to stay until the next interview six to seven months in the future. However, persons considered to be the head of the household were included as household members, even if present for less than three months. The household sample was stratified based on geographic zone, community death rates, and indicators at the household level that were thought to be predictive of future adult deaths. Households were interviewed a maximum of four times at seven-month intervals, using an extensive socioeconomic questionnaire answered by each member of the household. The household questionnaire also obtained information on the age, sex, schooling, occupation, and cause of death of all household members and nonresident relatives who died.

The KHDS did not attempt to measure the HIV seroprevalence of respondents. However, the symptoms of AIDS are widely recognised in the region, and household members were not reluctant to declare a death as caused by AIDS. This analysis classifies an individual as having died from AIDS if a health practitioner was said to have made an AIDS diagnosis or if family members believed that AIDS was the cause of death.[2]

Section Four: Methodology

In order to examine the relationship between socioeconomic characteristics and the probability of dying of AIDS or other causes, we pooled two samples of individuals:

1. all household members aged 15 and older who did not die during the survey (n=3,384)
2. all household members who died from 12 months before the first interview until the end of the last interview (n=358).

This left us with a total sample of 3,742 individuals, of which there were 1,657 men and 2,085 women. For individuals last observed alive, we used their characteristics the first time they were observed. For those who died, the characteristics reported are those at the time of death.

Probit regressions were run for two dichotomous (0/1) dependent variables – whether the person died of AIDS and whether the person died from other causes – using Stata, release 5 (1997). We used as regressors individual characteristics that could be assumed to be exogenous with respect to the risk of death – age, education, and occupation – and we analysed samples of men and women separately, since the socioeconomic correlates of male and female HIV infection may be different.

Ages are entered as five-year age groups up to the age of 49, with an additional dummy variable for those aged 50 and older and with ages 15 to 19 as the reference group. Years of educational achievement are included in dummy variable form for lower primary (one to three years), upper primary (three to six years), completed primary (seven years), and secondary and higher schooling (eight to 18 years), with the reference group of no formal schooling.

Men's occupations are classified into nine groups:

- farmer
- fisherman
- merchant/trader
- transport
- construction
- white collar
- factory worker
- skilled worker
- other.

Because of the very small numbers of women in some occupations, it was necessary to collapse the female occupation categories into only four:

- farmer
- merchant/trader
- white collar
- other (which includes all other occupations, domestic work, and no occupation).

Farmer was used as the reference group in both the male and female regressions. We also report below results for the relation between the probability of death from AIDS and other causes and the value of physical assets per capita in each person's household as of the first time that the household was interviewed. Physical assets include the value of land, housing, livestock, farm and business assets, and durable goods.

For ease of interpretation, the results are presented as the predicted probability of dying for different levels of a specific explanatory variable, while setting the value of all other explanatory variables at their mean.

Section Five: Results

Overall, about 9.6 per cent of the adults in this pooled sample had died.[3] Those who died of AIDS were nearly 15 years younger, on average, than those who died of other causes and only slightly older than those who lived (see table 2). Roughly the same percentage of men and women were deceased in the pooled sample, but 62 per cent of the reported AIDS deaths were female, compared to half of non-AIDS deaths. This finding is consistent with other studies in the region that have found a higher percentage of women than men infected with HIV (Barongo and others 1992; Berkley and others 1990).

Those who died of AIDS had a year more of schooling than those who did not die; they had nearly two years' more schooling than those who died of other causes, who were considerably older. Consistent with this finding, those who died of AIDS were much more likely to have completed primary schooling and to have completed some secondary or higher schooling. Those who died of any cause (AIDS or non-AIDS) were considerably less likely to be farmers than were those who remained alive – an indication that they may have been exposed to occupation-related risks – and more were likely to be white-collar workers.

Figure 1 shows the predicted probability of dying by age and cause of death for men and women, holding all other regressors at their sample means. The probability of death from AIDS rises steeply from age 15, peaks between ages 30 and 45, then declines (figure 1a). The probability of death from AIDS rises at younger ages for females than for males and begins its decline at an earlier age as well. This age pattern of AIDS mortality mirrors the results of other studies of HIV infection by gender (Berkley and others 1990; Grosskurth and others 1995; Wagner and others 1993).

Table 2. Descriptive statistics among those who died of AIDS, those who died of other causes, and those who survived

Characteristic	AIDS death	Non-AIDS death	Alive
Age (years)[a]	33.7	47.9	32.5
Female (per cent)[b]	62.1	50.5	55.8
Years of schooling (mean)[c]	5.84	3.96	4.70
Completed schooling (per cent)[d]			
None	8.6	30.7	21.1
1–3 years	5.7	9.6	9.0
4–6 years	24.3	26.2	26.4
7 years exactly	53.6	28.4	37.4
8–18 years	7.9	5.1	6.2
Occupation (per cent)			
Farmer[d]	67.9	64.7	82.7
White collar[d]	10.0	7.3	2.7
Sample size	140	218	3,384

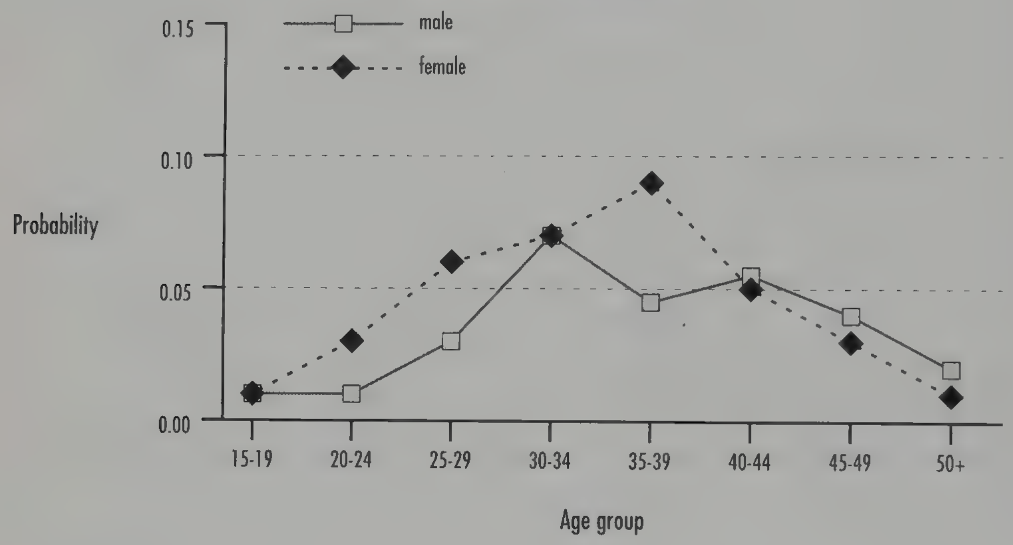
a. Difference in mean age between those who died from AIDS and those who died from other causes is statistically significant at p<.001.
b. Difference in per cent female across groups is statistically significant at p<.10.
c. Difference in mean years of schooling across groups is statistically significant at p<.001.
d. Differences in proportions across groups are statistically significant at p<.001.

The probability of dying from other causes has a very different age profile, rising more slowly in the most productive years and then increasing more rapidly with age (figure 1b). While there are most likely some errors in the classification of deaths due to AIDS and other causes, the age profile of the probability of death due to AIDS and other causes generally adheres to the expected pattern, given what we know about HIV transmission and AIDS mortality.

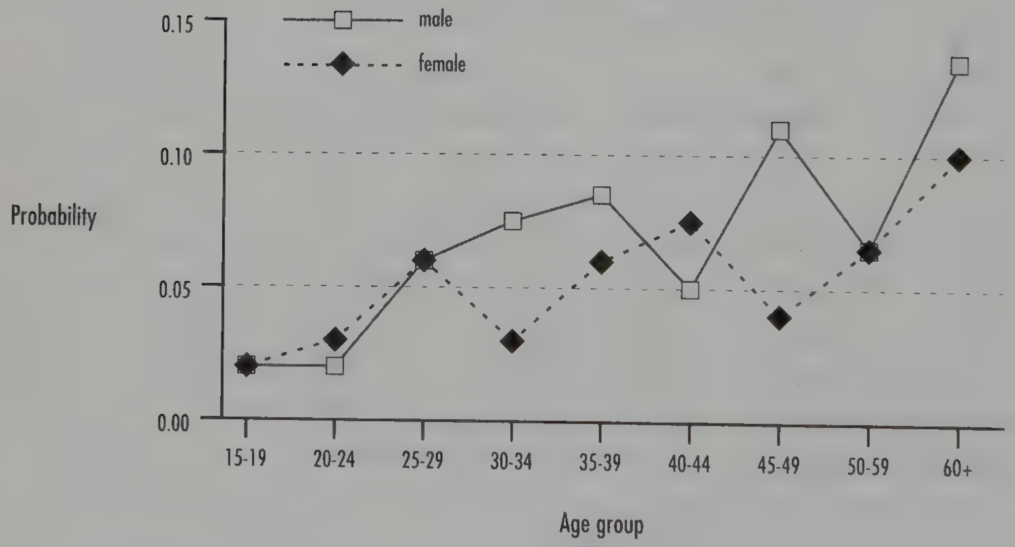
Figure 2 compares the predicted probability of death due to AIDS and due to other causes by sex and completed schooling, controlling for age and occupation. The probability of death due to causes other than AIDS generally falls with increasing education for both men and women, although this effect is not jointly significant for either gender. However, the probability of death from AIDS shows a dramatically different pattern.

Among women, it rises with education, peaking at completion of primary schooling before declining again. This result is jointly statistically significant (p=.0107). Although not statistically significant, among men the probability of death due to AIDS declines with less than full primary schooling, then rises at seven years, before falling again.[4] Put another way, for both men and women, the probability of dying of AIDS is highest for those who have completed primary

Figure 1. Predicted probability of death by age, sex, and cause of death



a. Death due to AIDS



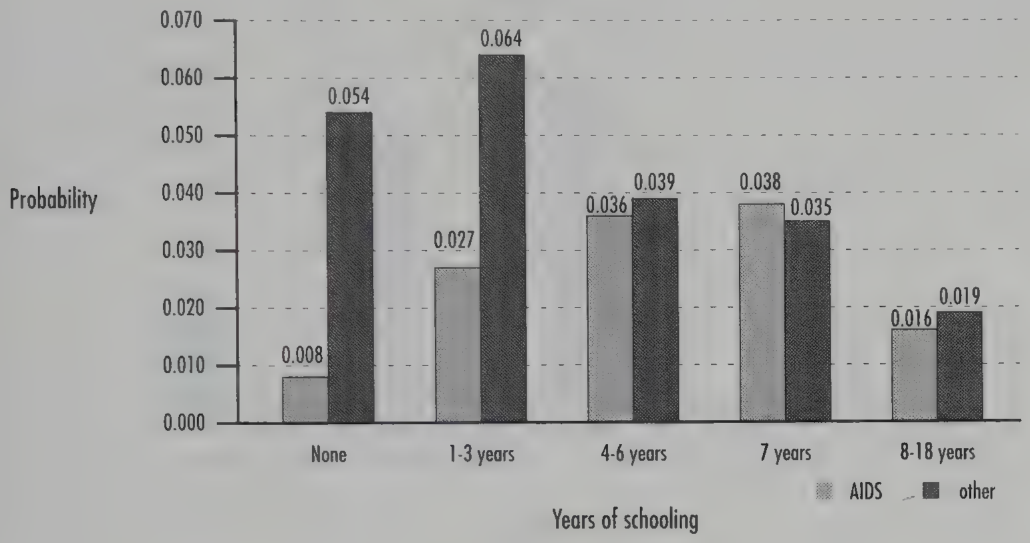
b. Death due to other causes

schooling, while the probability of death due to other causes is highest for those with no schooling or only a few years of primary.

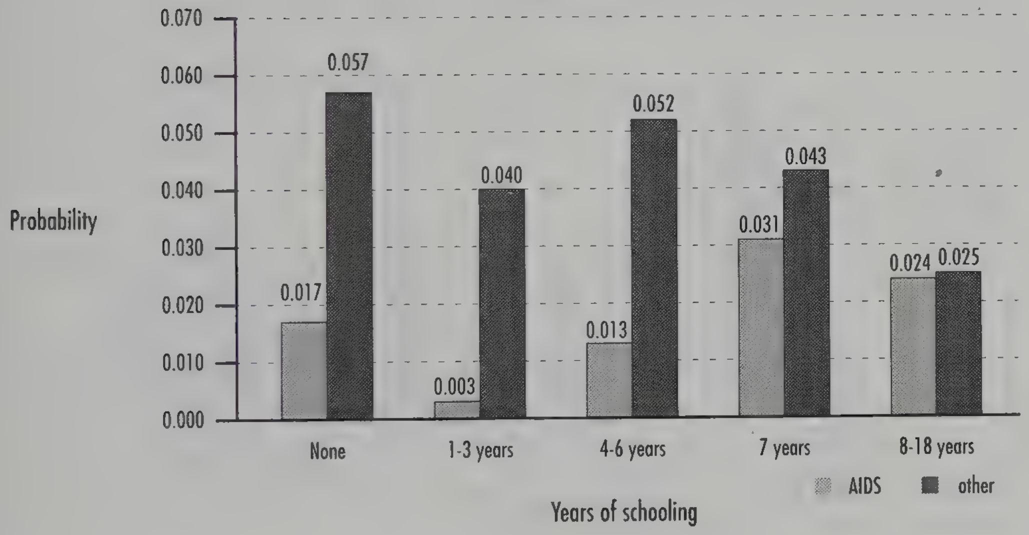
Controlling for age and education, the predicted probability of death from causes other than AIDS is higher for all occupations than is the risk of death from AIDS, and this is true for men and women (figure 3). Farmers of both sexes have the lowest probability of death due to causes other than AIDS, compared with other occupations; 73 per cent of men and 88 per cent of women were farmers in this pooled sample of those who died and those who lived. Men who are fishermen, skilled workers, and in other occupations and men and women who are merchants/traders and white-collar workers have a

Figure 2. Predicted probability of death due to AIDS and other causes, by sex and education

a. Men



b. Women



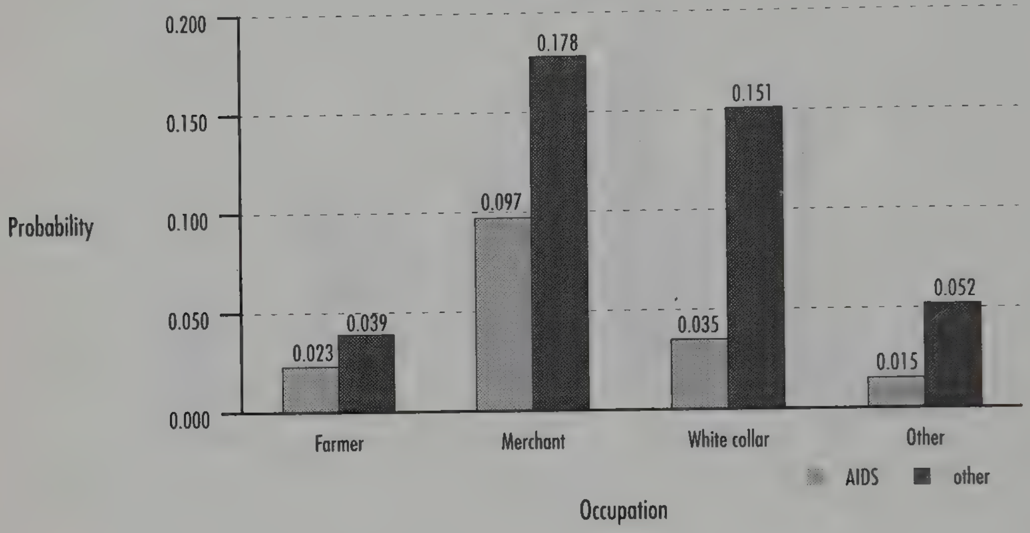
significantly higher probability of death due to causes other than AIDS than do farmers of the same sex.

Women who are merchants and men who are fishermen are the most likely to die from any cause – AIDS or non-AIDS. Fishermen, for example, are about five times more likely to die of AIDS and of other causes than are farmers. Only male fishermen and female merchants/traders have a significantly higher risk of dying of AIDS, compared to farmers.

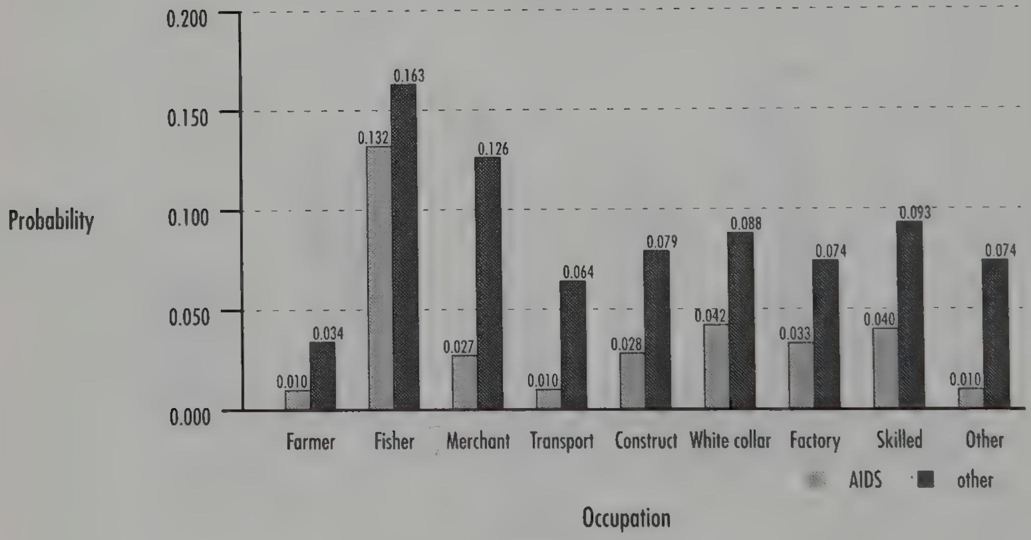
Additional regressions linked each person, living and dead, to the value of the household's physical assets per capita in the first passage the household was observed. Under normal circumstances, one would expect that the risk of

Figure 3. Predicted probability of death due to AIDS and other causes, by sex and occupation

a. Women



b. Men



death due to any cause would decline with increased wealth, holding age and education constant. This is because of presumed better nutrition and better access to health care among the wealthy. Indeed, the probability of death due to other causes was lower among men in households with higher assets. However, there was no relation between physical assets and the probability of dying of AIDS for adults of either gender, nor for the probability of death from other causes for women. These results confirm that while wealth may protect people from the risk of death from other causes, it does not protect them from the risk of death due to HIV/AIDS, at least as of the time at which these individuals were infected.

Section Six: Discussion

Although the HIV status of those who died was not measured in the KHDS, there are several results supportive of the quality of the verbal autopsy reports of surviving household members: the age pattern of AIDS deaths compared to deaths from other causes; the gender pattern of the predicted probability of AIDS deaths by sex; and the fact that a very high proportion of those reported to have died from AIDS had also suffered four symptoms.

There is a lag between HIV infection and death of about 10 years in developed countries, and this is believed to be substantially shorter in developing countries, perhaps as short as five to six years (Mulder 1996).

This means that those reported to have died due to AIDS in the KHDS were most likely infected in 1984–88. During the time that these individuals were infected, the probability of infection was still correlated with higher levels of education. This pattern of infection may be due to riskier behaviour among those with higher levels of education at that time (e.g., multiple sexual partners without use of condoms) or, in the case of women, a reflection of the likelihood that women with more education are likely to marry men with more education and who engage in risky behaviour. The results also show that, while household assets or wealth offer some protection from death from other causes (at least for men), they do not protect people from HIV/AIDS mortality.

What are the implications of these findings?

- First, the results here testify to the enduring, lagged impact of AIDS mortality long after HIV infection; even as the socioeconomic patterns of new infections change, AIDS mortality will continue to affect those of higher status who were infected long ago and disproportionately to affect the skilled labour force.
- Second, while we may expect the socioeconomic characteristics of those who are infected or who die from AIDS to change over time as the most educated differentially act on prevention information, this is not something that will automatically occur. [DHS results show that Tanzanian men and women with even a few years of schooling are more likely to use condoms with casual partners (Filmer 1998, this volume).] However, the DHS data also show that as recently as 1994, only half of women and two-thirds of men nationally who had had a recent casual or commercial sexual partner were aware that condom use prevents HIV infection.

  In fact, we have no evidence that there has been any change in the socioeconomic characteristics of those newly infected in Tanzania. The most recent study available, using data from 1995–96, found a positive correlation between education and infection among women attending antenatal clinics in Dar es Salaam (Msamanga and others 1996). These women were probably infected far more recently than those in the Kagera sample who had died, and they live in a large city with presumably greater availability of condoms and information on HIV prevention.

If prevention efforts have not been able to reduce infection among women with higher socioeconomic status in urban areas – presumably those most likely to respond – then surely the effectiveness of the overall prevention strategy must be called into question.

- Finally, adult members of poor households are more likely than those in better-off households to die from causes other than AIDS, while AIDS deaths occur among households across the economic spectrum. A larger proportion of households experiencing an adult AIDS death, while suffering emotionally the loss of a loved one, will have the financial means to cope with the death. This means that in Tanzania, as in other low-income countries, in order to make the largest contribution to mitigating the impact of AIDS, programmes should focus on helping households with the fewest resources.

Notes

1 The research assistance of Meera Venkataraman and Mattias Lundberg is gratefully acknowledged. This paper is one of several products of the research project on 'The Economic Impact of Fatal Adult Illness due to AIDS and Other Causes', Mead Over, principal investigator, and co-investigators Martha Ainsworth, Phare Mujinja, Innocent Semali, Godlike Koda, and George Lwihula. The project was financed by DANIDA, USAID, and the World Bank Research Committee. The opinions expressed in this paper are those of the authors.

2 Partial verification of an AIDS diagnosis is possible by reference to direct questions about four specific symptoms: chronic diarrhoea, chronic fever, substantial weight loss, and skin rash. Two-thirds of the adults reported to have died from AIDS had all four symptoms and another 21 per cent had three of the four symptoms (Ainsworth, Ghosh, and Semali 1995). Among those dying of other causes, only one-third reported three or more of these symptoms.

3 This figure should not be interpreted as a death rate, since the time frame over which the deaths occurred is not well defined, those who left the household in the 12 months before the first interview and who remained alive were not enumerated, and the sample was stratified.

4 Ntozi and others (1997) also find a statistically significant positive effect of primary and secondary schooling on the probability of dying of AIDS in a sample of nearly 4,000 deaths in six districts of Uganda.

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7

The socioeconomic correlates of sexual behaviour: A summary of results from an analysis of DHS data

by Deon Filmer[1]

Section One: Introduction

Patterns of sexual behaviour are one of the primary determinants of the spread of HIV, and understanding these patterns is vital to predicting the course of the disease and potentially targeting public interventions. Using a set of recently collected data on sexual behaviour from nine countries, this paper seeks to answer the question:

- What are the socioeconomic correlates of sexual behaviours that increase or decrease the risk of HIV/AIDS infection for women and men?

There are many studies that have analysed the socioeconomic correlates of HIV infection (see, for example, Barongo and others 1992; Grosskurth and others 1995; Serwadda and others 1992; Menon and others 1998, this volume). The results from these studies tend to support the hypothesis that, in the general population of many developing countries, HIV infection tends to be associated with higher socioeconomic status for both men and women. Studies that focus directly on the socioeconomic correlates of sexual behaviour, one of the primary means by which the disease is spread, are much more rare.

In this paper, multivariate analysis is used to analyse individual-level Demographic and Health Survey (DHS) data for nine countries (or in one case a region within a country). Four of these countries are in Eastern and Southern Africa (Kenya, Tanzania, Uganda, and Zimbabwe), three are in Central and Western Africa (Burkina Faso, Central African Republic [CAR], and Côte d'Ivoire), and two are in the Latin America and Caribbean region (the northeast region of Brazil and Haiti). The analysis focuses on three outcomes:

- whether the respondent had a recent non-regular sexual partner
- whether the respondent used a condom during sexual intercourse with a recent non-regular partner
- whether a respondent aged 15 to 19 has ever had sexual intercourse.

The socioeconomic correlates included are:

- age and education
- urban residence

- occupation of the respondent
- assets owned by members of the respondent's household
- attributes of the respondent's community
- the characteristics of husbands, for married women.

Section Two: Background

The analysis carried out here is similar in spirit to that in Caraël (1995), which analyses data from 15 countries gathered by the World Health Organisation/Global Programme on AIDS (WHO/GPA) for the express purpose of studying sexual behaviour. The following are some of the main conclusions from that study:

- In all surveys, men were more likely to report nonmarital sex and a higher number of sexual partners than women, and the difference was particularly marked in some populations.
- Patterns of sexual behaviour in urban and in rural areas were similar.
- There was huge cross-country variability in the onset of sexual activity.
- Logistic regressions to assess the simultaneous effects of age, education, marital status, residence, and personal vulnerability, and the likelihood of non-regular [...] sex in the last 12 months showed that age and marital status were the most influential demographic predictors.

Caraël (1995) presents very useful analysis of the new WHO/GPA data. However, much of the analysis is bivariate or is conditioned on endogenous variables (such as marital status, perceived risk, past sexual experience) that could lead one to mischaracterise the relationship under study. The current analysis uses a different set of existing data to look at the unconditional relationships between socioeconomic characteristics and aspects of sexual behaviour.

Table 1 presents some summary background statistics on HIV prevalence and knowledge and beliefs about AIDS for the countries included here. The WHO estimates of seroprevalence rates for the entire adult population range from a low of 0.7 per cent in Brazil to a high of 17.4 in Zimbabwe. Among the countries included, the AIDS epidemic is most severe in the countries in the Eastern and Southern Africa region.

Table 1 also reports the US Bureau of the Census estimates of HIV prevalence rates by risk group and urban-rural residence. These estimates show that there are large differences in the prevalence of HIV between the various population groupings: HIV prevalence reaches as high as 86 per cent in the major cities in Kenya and Zimbabwe among the high-risk population.

Knowledge of AIDS is almost universal in all the groups under consideration here. The percentage who know of AIDS is below 95 per cent in only five (out of 32) cases – women in rural Burkina Faso, rural CAR, rural Côte d'Ivoire, and men in rural Burkina Faso and rural Côte d'Ivoire – and even in those cases it is above 80 per cent. More than 89 per cent of those who know of AIDS know that sexual intercourse is a mode of transmission in Kenya, CAR, Haiti, and among men in

Burkina Faso. Hence, most are probably aware that changes in sexual behaviour are likely to reduce their likelihood of contracting HIV. Among women in Burkina Faso, only 57 per cent in rural areas and 76 per cent in urban areas know that sexual intercourse is a mode of transmission. Knowledge of condom use as a method to avoid AIDS is not nearly as high. Among the urban populations it ranges from 39 to 68 per cent, and among rural populations it is generally substantially lower and ranges from 11 to 65 per cent.

Table 1. Selected background characteristics on HIV prevalence and knowledge and beliefs regarding AIDS for the countries included in the study

		Eastern and Southern Africa				Central and Western Africa			Latin America and Caribbean	
		Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Brazil	Haiti
Adult HIV seroprevalence estimates (%)										
Adult population[a]		8.3	6.4	14.5	17.4	6.7	5.8	6.8	0.7	4.4
Capital/major city low risk[b]		18.1	13.7	na	32.0	12.0	16.0	12.5	2.7	15.7
Capital/major city high risk[b]		85.5	49.5	na	86.0	60.4	31.0	77.0	13.3	41.9
Outside major city low risk[b]		10.3	na	na	na	na	6.5	na	0.3	4.0
Knowledge of AIDS (%)[c]										
Women:	urban	99.2	99.5	99.8	99.8	97.5	98.3	97.3	na	99.6
	rural	97.5	97.1	98.7	98.3	80.7	88.9	90.2	na	96.9
Men:	urban	99.7	99.5	100.0	100.0	98.3	99.4	98.6	na	99.9
	rural	98.9	98.2	99.9	99.4	92.4	98.7	94.0	na	96.3
Of those who know of AIDS, the per cent who believe that a mode of transmission is sexual intercourse[c]										
Women:	urban	93.6	na	92.6	na	75.5	84.4[d]	82.1	na	89.1
	rural	89.6	na	91.7	na	57.1		79.0	na	89.1
Men:	urban	97.1	na	na	na	91.3	93.5[d]	na	na	93.6
	rural	95.7	na	na	na	91.3		na	na	90.9
Of those who know of AIDS, the per cent who believe that condom use is a method to avoid AIDS[c]										
Women:	urban	39.4	54.8	44.6	67.6	38.6	42.3[d]	45.2	na	na
	rural	16.6	28.9	17.5	52.0	10.5		23.1	na	na
Men:	urban	45.2	63.0	57.6	67.7	62.7	49.0[d]	63.5	na	na
	rural	32.6	44.9	27.9	65.1	30.1		49.7	na	na

na Not available.

Note: a and b are as reported in World Bank (1997, statistical appendix) and include estimates that used samples of at least 100. 'High risk' is defined as prostitutes and clients, STD patients, or other persons with known risk factors. 'Low risk' is defined as pregnant women, blood donors, or other persons with no known risk factors.

a. WHO estimates as of December 1994.

b. US Bureau of the Census as of July 1995.

c. DHS final, summary, and preliminary reports, various years.

d. Unavailable as disaggregated urban-rural estimates (Macro International Inc., various years, 1995, 1996).

Section Three: Data and methodology

The data used are from the Demographic and Health Surveys. In general, the samples of women and men are constructed from samples of households; i.e., households are randomly selected and then within these households, all eligible women are interviewed. In a subsample of the households (e.g., every second household in Tanzania, or in a systematic subsample of 40 per cent of households in Zimbabwe), all men ages 15–59 (20–59 in Kenya) are interviewed. In Northeast Brazil, the sample analysed is husbands of the female respondents.

The sample sizes are large: the number of women ranges from 4,225 in Tanzania to 8,099 in Côte d'Ivoire, and the number of men (husbands) ranges from 1,203 in Northeast Brazil to 2,552 in Côte d'Ivoire. The samples were collected relatively recently, with the oldest being Northeast Brazil in 1991. These two features of the these DHS data sets make them particularly attractive for the present analysis.

On the other hand, the DHS questionnaires were not designed primarily to collect data on sexual behaviour. Rather, they have traditionally sought information on fertility, contraception, and infant and child health and mortality.

The questions on sexual behaviour have been introduced only recently, which helps to explain why only a few countries can be included in this study, as well as the variation in the questionnaires from country to country. Moreover, responses to questions on sexual behaviour are likely to suffer from reporting problems. If there are systematic differences between the responses of individuals with different demographic (or socioeconomic) backgrounds then the results must be treated with a great deal of caution. For example, using data from Côte d'Ivoire, Gersovitz and others (1995) attribute up to three-quarters of the imbalance between sex acts reported by men and women to the tendency of women to underreport frequency of sexual intercourse.

Multivariate probit regression was used to analyze the data. The basic results are derived from a specification that includes age, education, and urban/rural residence. Subsequent results add occupation; then asset ownership and community infrastructure; and then finally the husbands' characteristics. The data points shown in the figures are of the predicted probabilities derived from these probit regressions.

Section Four: Correlates of sexual intercourse with a 'non-regular' partner

In these data sets, the term 'non-regular partner' generally refers to a sexual partner who is not a spouse and with whom the respondent is not living. However, it is not always possible to distinguish between a regular partner that the respondent does not live with and an occasional or one-time partner. The questions relating to sexual behaviour were asked in slightly different forms and cover different reference periods in the various data sets under consideration (see Appendix).

Among those with at least one non-regular partner, the overwhelming majority of both men and women report having only one of these partners. Moreover, in all the samples, men are more likely than women to have had at least one non-regular partner; among those with at least one non-regular partner, men are systematically more likely than women to have more than one. There are only a small number of individuals who report having a large number of non-regular partners: among those with at least one, no more than 5 per cent of women or men ever report having more than five non-regular partners (except for men in Kenya).

4.1 Age, education, and residence

The relationship between various aspects of sexual behaviour and education is likely to be complex. If education is positively correlated with income, and sex with a non-regular partner is increasing with income (as some have suggested is the case for men), then we should observe a positive relation between education and the probability of non-regular sex.

On the other hand, higher education levels might lead individuals to be exposed to or to heed prevention messages and engage in less non-regular sex, or less 'risky' sex (e.g., by using a condom). Caraël (1995) found that, for both men and women, there is a positive relationship between non-regular sex and educational attainment in most of the samples he analysed. Kapiga and others (1995) found that, in a sample of women in Dar es Salaam, Tanzania, education was positively related to a higher number of sexual partners as well as to condom use. Ahlburg and others (1996) found that, in the Philippines, 'men whose wives believed that they engaged in extramarital sex were more educated'.

In order to estimate these relationships with a minimal imposition of functional form, the age of the respondent is included as dummy variables for five-year age groups (20–24, 25–29…) with the omitted category being those aged 15–19. The educational attainment of the respondent is included as dummy variables for years of formal schooling attained (1–3, 4–6(7,8), 7(8,9)–10, 11 and over) with the omitted category being no schooling. The cutoff selected for the second and third dummy variables is based on the number of years of primary school in the country's educational system. It is equal to six years in Burkina Faso, CAR, Côte d'Ivoire, and Haiti; seven years in Tanzania, Uganda, and Zimbabwe; and eight years in Kenya and Brazil (UNESCO 1995).

There are strong differences in the HIV seroprevalence rates between urban and rural areas and there may be strong differences in behaviours as well. Therefore, in the multivariate analysis, the urban/rural status of the household is included as a dummy variable equal to one if the household resides in an urban area. Furthermore, the hypothesis that the relationship between sexual behaviour and education differs by residence is tested by including a set of interaction terms between education and the residence dummy.

The set of age variables is significant in all of the samples (except husbands in Northeast Brazil, where it is significant at the 11 per cent level). In the samples of men, as age increases, the probability of having had a non-regular partner tends to first increase and then decrease, with the peak occurring in the 20–24 or 25–29 age group (it is downward sloping from the 15–19 age group of husbands in Northeast Brazil) (table 2). The relationship is not as pronounced for women, although the effect of age is statistically significant and suggests a downward trend from the 15–19 age group (or a slight peak in the 20–24 age group) (figure 1a).

Table 2. Relationship between age and the probability of having a non-regular partner

	Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Brazil (NE)	Haiti
Women	–	–	–	∩	–	–	–	∩	
Men	–	∩	∩	∩	∩	∩	∩	–	∩

Note: +,-,∩ indicate a positive, negative, and inverted u-shaped relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated.

The relationship between education and the probability of having had a non-regular partner varies across gender and country. For women, the relationship tends to be flat, with a slight positive slope for rural women in Kenya, Tanzania, Uganda, and Zimbabwe (although insignificant for Tanzania and Zimbabwe), and a slight negative one for urban women in those countries (in Kenya, the relationship peaks in the one to three years of schooling group) (table 3). Among women in Burkina Faso, CAR, and Côte d'Ivoire, education and sex with a non-regular partner tend to be positively related, but there is virtually no relationship for women in Northeast Brazil. For men, the relationship is weaker: education has a significant relationship in only four of the samples – Burkina Faso, CAR (at the 10 per cent level), Côte d'Ivoire, and Haiti. In Burkina Faso, CAR, and Côte d'Ivoire, the association is a positive one. In Haiti, the effect peaks for those with four to six years of education (figure 1b).

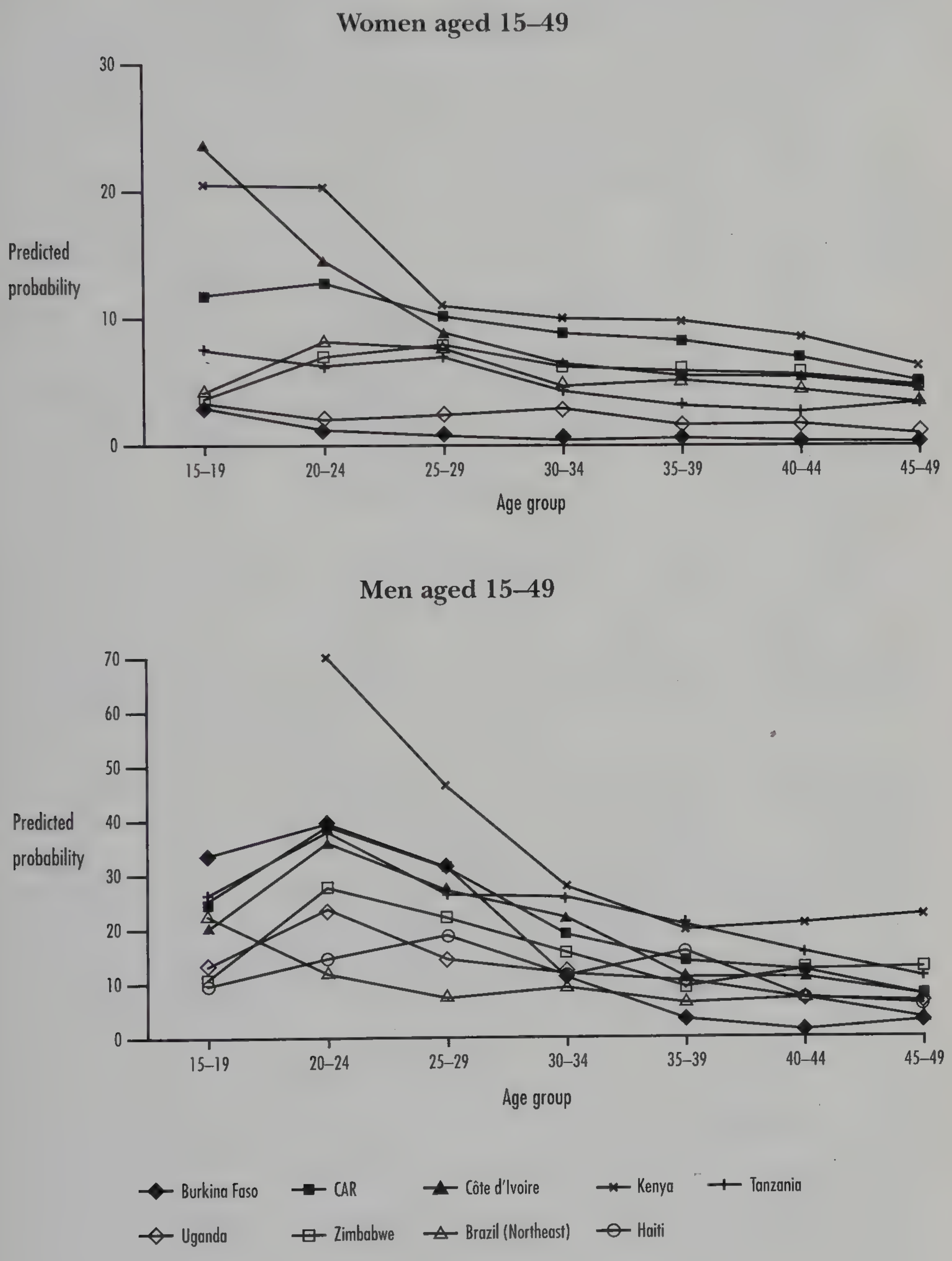
Women in urban areas are significantly more likely to have had a non-regular partner than those in rural areas in all the countries under study, except for Kenya, where the effect is not significant (table 4). Moreover, the predicted probabilities are at least twice as high for urban women as for rural women.

Table 3. Relationship between education and the probability of having a non-regular partner

	Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Brazil (NE)	Haiti
Women	+(r) ∩(u)	ns(r) –(u)	+(r) –(u)	ns(r) –(u)	+	+	+	ns	
Men	ns	ns	ns	ns	+	+	+	ns	∩

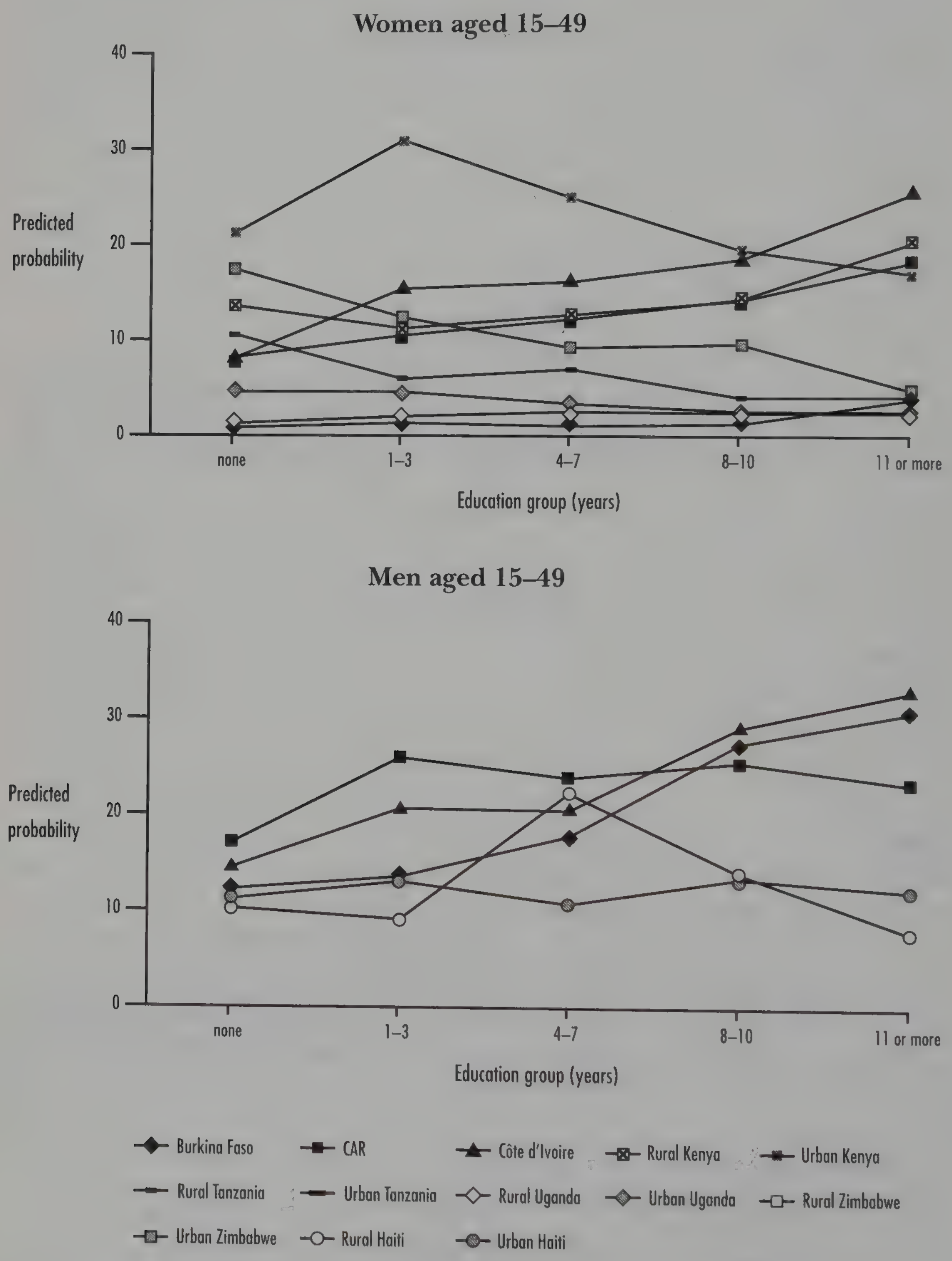
Note: +,-,∩ indicate a positive, negative and inverted u-shaped relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated. (u) indicates urban and (r) indicates rural.

Figure 1a. Predicted probability of having had sex with a non-regular partner, by age



Note: Because definitions vary across countries, comparisons should not be made between the levels of the lines.

Figure 1b. Predictability of having had sex with a non-regular partner, by education



Note: Because definitions vary across countries, comparisons should not be made between the levels of the lines. Certain points are not shown because the esimated relationship was insignificant. These are rural Tanzania, rural Zimbabwe, and Northeast Brazil for women, and Kenya, Tanzania, Uganda, Zimbabwe, and Northeast Brazil for men.

For men, the results are more varied. Urban men in Uganda, Burkina Faso, CAR, and (husbands in) Northeast Brazil are significantly more likely to have had a non-regular partner than men in rural areas, although the differentials are not as large as those for women. In the other countries the two groups of men are mostly equally as likely to have had a non-regular partner (in Zimbabwe urban men are *less* likely, although the effect is not statistically significant).

Table 4. Relationship between urban residence and the probability of having had a non-regular partner

	Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Brazil (NE)	Haiti
Women	ns	+	+	+	+	+	+	+	
Men	ns	ns	+	ns	+	+	ns	+	ns

Note: +,- indicate a positive and negative relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated.

4.2 Occupation

There is some evidence that occupation is related to risk of HIV infection. For example, Ryder and others (1990) show that a sample of male employees of a bank had higher seroprevalence rates than textile factory employees in Kinshasa, Zaire. Moreover, within each place of employment, those in the higher salary brackets had the highest prevalence rates. In East Africa, Menon and others (1998, this volume) find that the probability of a head of household being HIV-positive is strongly related to occupation among males and females in a rural district of Uganda.

Ainsworth and Semali (1998, this volume) find that the probability of an adult having died from AIDS is strongly related to occupation among men in the Kagera Region of Tanzania. In their study of extramarital sex in the Philippines, Ahlburg and others (1996) found that men who were engaged in occupations other than farming were more likely to have engaged in extramarital sex, according to their wives.

If individuals in certain occupations have higher incomes (e.g., professional occupations) and if income is positively related to non-regular sex, then we should observe a positive relation between these occupations and the probability of sex with a non-regular partner. In addition, certain occupations might expose individuals to higher risk, even controlling for income (e.g., truck drivers, who would be classified as being in a manual occupation, or waitresses in bars, who would be classified as being in a service occupation). In order to explore the hypothesis that, conditional on education, individuals in different occupations are differentially exposed to risk, a set of dummy variables for occupation are included. These are:

- professional, technical, and managerial occupations (hereafter referred to as 'professional' occupations)
- clerical, sales, household and domestic, and service occupations (hereafter referred to as 'service' occupations)

- skilled and unskilled manual occupations (hereafter referred to as 'manual' occupations)
- none, missing, and other occupations (hereafter referred to as 'none/missing')
- the omitted category is agricultural occupations.

Occupation has an independent effect in all of the samples of women: the coefficients on the occupation dummies are jointly significant in all of the samples. They are jointly significant in the samples of men in Kenya, Uganda, Burkina Faso, CAR, and Côte d'Ivoire (at the 10 per cent level). In all the samples of women, it is those who work in the service or manual sector who have the highest predicted probability of having had a non-regular partner. For men, those in manual occupations are the most likely to have had a non-regular partner in Kenya, Uganda, CAR, and Côte d'Ivoire (the same is true in Zimbabwe and Haiti although the effect is not statistically significant). In Burkina Faso it is those in professional occupations who are most likely (the same is true in Tanzania although the effect is not statistically significant).

4.3 Asset ownership

In order to explore whether sexual behaviour is related to wealth, insofar as this can be measured using these surveys, two dummy variables are included that capture in a very rough way the durable goods owned by the household: a dummy variable equal to one if the dwelling in which the respondent resides has a 'finished' type of floor (for example, parquet, finished wood, tiles, cement, carpet); and a dummy variable equal to one if a member of the respondent's household owns a car (except for Kenya, where the variable is whether anyone in the household owns a bicycle).

In most of the cases, for both women and men, the relationship is not significant (table 5). For women, in most cases where the coefficient is significant, the relationship tends to be negative; i.e., higher wealth, as measured in this crude fashion, tends to be negatively associated with the probability of having had a non-regular partner. One exception is finished flooring in Kenya, which is associated with a higher likelihood of having had a non-regular partner. Another

Table 5. Relationship between asset ownership and the probability of having had a non-regular partner

	Kenya*	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Brazil (NE)	Haiti
Women:									
floor	+	ns	ns	ns	ns	–	+	–	
car	–	ns	ns	ns	–	ns	+	ns	
Men:									
floor	ns	+	ns	ns	ns	ns	+	ns	+
car	ns	ns	—	ns	+	ns	+	ns	ns

* In Kenya, the car variable refers to a bicycle.

Note: +,- indicate a positive and negative relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated.

exception is for Côte d'Ivoire, where having a finished floor and owning a car are both positively associated with having had a non-regular partner.

Where the coefficients are significant in the samples of men, higher wealth is *positively* associated with the probability of having had a non-regular partner. The exception here is car ownership in Uganda, where the relationship is significant but it implies that car ownership is negatively associated with the probability of having had a non-regular partner.

4.4 Husband's education and occupation

There is some evidence that the socioeconomic status of a male partner is a strong predictor of a woman's risk of HIV infection (for example, Allen and others 1991, in urban Rwanda; Melbye and others 1986, in Lusaka). In particular, Allen and others (1991) show that a woman's risk of being infected rises substantially with her partner's education and income, but is only weakly related to her own education and income. Caraël and others (1988) find that, in a sample of couples in Kigali, Rwanda, the risk factors for HIV infection of the couples are generally the risk factors for the husband. In the DHS samples of women, the characteristics of their husbands (or the men with whom they are living) are collected. Where possible, dummy variables for the educational attainment and the occupation of the husband are introduced into the multivariate analysis.

Unsurprisingly, the fact that a woman has a husband is significantly associated with a lower probability of her having had a non-regular partner. Conditional on this, however, neither the set of husband's education variables nor the set of husband's occupation variables ever have a jointly significant effect on a woman's probability of having had a non-regular partner in any of the samples in which these relationships can be estimated.

Section Five: Condom use with a non-regular partner

The relationship between socioeconomic status and HIV prevalence, or risk of HIV infection, may be ambiguous as socioeconomic status may be positively related to some factors that increase the transmission of HIV (e.g., sex with infected partners) but may also be positively related to some factors that decrease the transmission of HIV (e.g., using condoms during such sex). In order to investigate the latter of these, we turn to the probability that a respondent used a condom when having sex with a non-regular partner.

The definitions of the variable relating to condom use with a non-regular partner again vary across countries (see Appendix). In fact, it should be interpreted with caution as the variable is constructed in quite different ways for the different samples.

In all the countries where both men and women were asked about condom use with a non-regular partner, men report using condoms more frequently than women (by as much as 20 percentage points in several countries).

The probit analysis of whether or not a condom was used with a non-regular partner was carried out only on the sub-sample of those who report having had at least one non-regular partner. Moreover, the relationship is only estimated for those samples for which there are at least 100 observations in this sub-sample: among the sample of women this was estimated only for Kenya, Tanzania, Zimbabwe, CAR, and Côte d'Ivoire. It was estimated for all the samples of men except for husbands in Northeast Brazil.

5.1 Age, education, and residence

The relationship between age and the probability of using a condom with a non-regular partner is only significant in the samples from Kenya and Tanzania, for women in Zimbabwe and Côte d'Ivoire, and for men in Uganda (table 6). Significant or not, there appear to be two shapes to the relationship: in Tanzania, Uganda, Zimbabwe, and Burkina Faso the relationship appears to be inversely U-shaped. In the other samples, the relationship is either flat, or slightly downward sloping (figure 2a).

Education and the probability of using a condom with a non-regular partner are strongly related. The association is significant in all the samples (at least at the 10 per cent level) except for men in Uganda and Burkina Faso (table 7). In all these cases, as educational attainment increases, so does the probability of using a condom(figure 2b).

Table 6. Relationship between age and condom use with a non-regular partner

	Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Haiti
Women	–	∩		∩	ns	ns	–	
Men	–	∩	∩		ns	ns	ns	ns

Note: +, -, ∩ indicate a positive, negative, and inverted u-shaped relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated.

Table 7. Relationship between education and condom use with a non-regular partner

	Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Haiti
Women	+	+		+		+	+	
Men	+	+	ns	+	ns	+	+	+

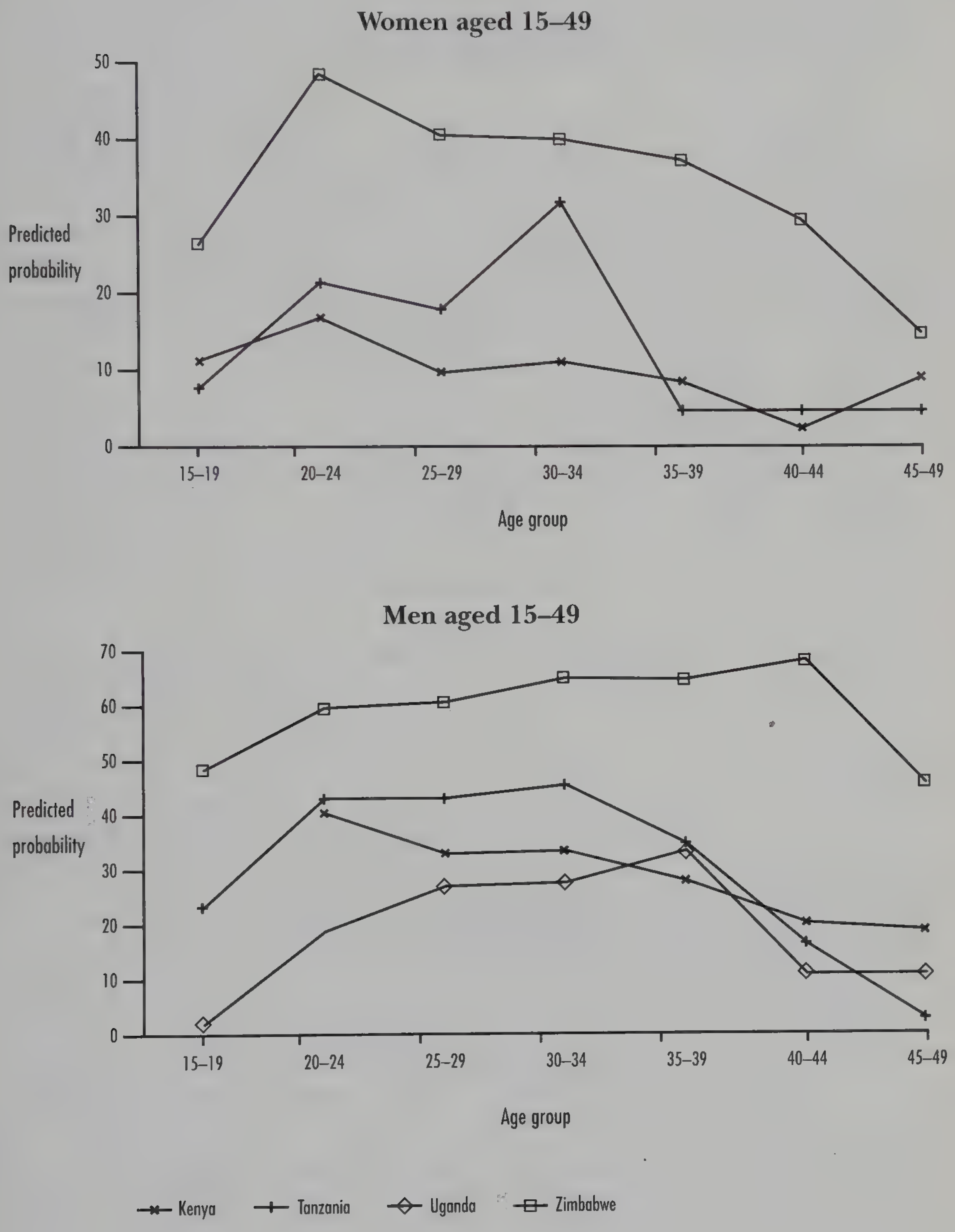
Note: +,- indicate a positive and negative relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated.

Table 8. Relationship between urban residence and condom use with a non-regular partner

	Kenya	Tanzania	Uganda	Zimbabwe	Burkina Faso	CAR	Côte d'Ivoire	Haiti
Women	ns	+		+		+	ns	
Men	ns	+	ns	ns	ns	ns	ns	ns

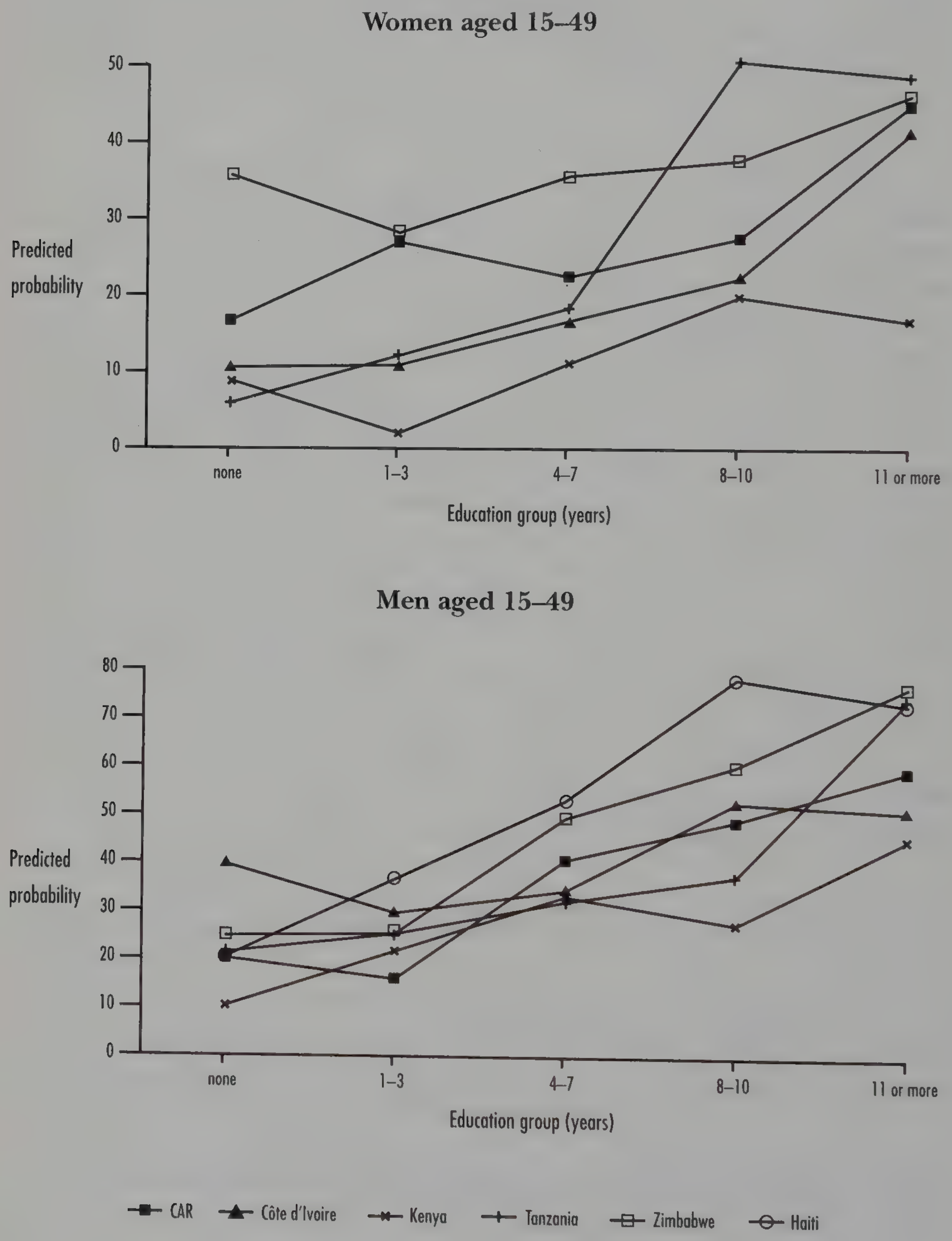
Note: +,- indicate a positive and negative relationship significant at least at the 10 per cent level, ns indicates insignificant. A blank entry indicates that the relationship was not estimated.

Figure 2a. Predicted probability of using a condom with a non-regular partner, by age



Note: Because definitions vary across countries, comparisons should not be made between the levels of the lines. Certain points are not shown because the estimated relationship was insignificant. These are Burkina Faso and CAR for women, and Burkina Faso, CAR, Côte d'Ivoire, and Haiti for men.

Figure 2b. Predicted probability of using a condom with a non-regular partner, by education



Note: Because definitions vary across countries, comparisons should not be made between the levels of the lines. Certain points are not shown because the estimated relationship was insignificant. These are Burkina Faso and Uganda for men.

Women in urban areas in Tanzania, Zimbabwe, and CAR are all more likely to have used a condom whereas in Kenya and Côte d'Ivoire there is no urban-rural differential after controlling for age and education (table 8). For men, the probability is always higher in urban areas, but the effect is significant only in Tanzania (and even there only at the 10 per cent level).

5.2 Occupation and assets

These variables are significant as a group only in Tanzania and Zimbabwe and for women in CAR and for men in Uganda and Côte d'Ivoire. For women in Tanzania and CAR and for men in Tanzania and Uganda, it is the same occupational group that has the highest probability of having had sex with a non-regular partner that has the highest probability of having used a condom during such sex (i.e., services for women in Tanzania, manual for women in CAR, and professional for men in Tanzania). In Zimbabwe it is women in manual occupations and men in professional occupations that have the greatest likelihood of using a condom. In Côte d'Ivoire it is men in professional occupations that have the highest probability of using a condom.

Asset variables are in general individually as well as jointly insignificant. The exception is finished flooring in CAR, which is associated with a higher probability of using a condom with a non-regular partner.

Section Six: Onset of sexual activity among 15 to 19 year olds

In order to analyse the onset of sexual activity, the binary variable 'ever had sexual intercourse' is analysed among those who are 15 to 19 years old. In the samples collected, this can be almost identically defined for all the samples of young women and men (ages 15 to 19) in all but three of the countries. In Brazil, the sample of men is a sample of husbands and the question of whether they had ever had sexual intercourse was not asked. In the Burkina Faso and Côte d'Ivoire samples the analysis could not be carried out for men.

Age and educational variables are each jointly significant in all the samples except education for men in Uganda, Zimbabwe, and CAR and for women in Côte d'Ivoire. In samples where this effect can be estimated for both males and females, men are more likely to have had sex at all ages in Tanzania and Haiti, equally as likely in Zimbabwe, and less likely in Uganda and CAR.

Unsurprisingly, the proportion of 15 to 19 year olds who have ever had sex is increasing with age. Caraël (1995) found that the shape of the relationship varied greatly across countries and that finding is somewhat echoed here. In almost all the African countries the probability starts at between 10 and 20 per cent for 15 year olds and increases almost linearly to reach between 60 and 70 per cent for 19 year olds. For women in Côte d'Ivoire it starts at about 40 per cent at age 15 and reaches 95 per cent for 19 year olds. The relationship in Northeast Brazil and Haiti is different: for women it is much flatter, starting at around 10 per cent at age 15 and reaching around

40 to 50 per cent at age 19. For men in Haiti the predicted probability starts much higher, about 35 per cent at age 15 but is also much flatter, reaching about 60 per cent at age 19.

In almost all of the samples, the higher the education level, the lower the probability that the respondent has ever had sex. The sole exception is men in Haiti, where the probability is increasing in educational attainment. For women in Burkina Faso, CAR, and Côte d'Ivoire there is no relationship between schooling and onset of sexual activity.

Women aged 15 to 19 in urban areas in Tanzania and women and men aged 15 to 19 in urban areas in Haiti are more likely to have had sex than their rural counterparts. For women aged 15 to 19 in Zimbabwe, Burkina Faso, and Côte d'Ivoire, the result is reversed; i.e., those in urban areas are less likely to have had sex than their rural counterparts. For men there are no significant differences between urban and rural areas (except in Haiti).

Section Seven: Conclusions

Conclusions drawn from this study are subject to many caveats. The most important is perhaps that these are self-reported data on sexual behaviour and it is not hard to think why this would be a difficult subject on which to collect reliable data. Moreover, the questionnaires were not designed with the express purpose of collecting this type of data, but rather data on fertility, contraception, and infant and child health and mortality. Furthermore, although the focus here is on the 'socioeconomic' correlates, the data do not include data on wages, income, or expenditures, which would have allowed a more complete examination of the issue.

Keeping these caveats in mind, this analysis has revealed various patterns in the relationship between socioeconomic indicators and sexual behaviour. Certain patterns appear to be consistent across countries. In particular:

The probability of having had a non-regular partner

- tends to display an inverted U-shaped relationship with age for men and tends to be uniformly decreasing in age for women
- tends to be higher for both women and men in urban areas relative to rural areas
- is often unrelated to asset ownership, but when the relationship is significant it tends to be negative for women and positive for men
- is unrelated to husband's educational and occupational characteristics for women.

The probability of using a condom with a non-regular partner

- tends to have either an inverted U-shaped relationship or a downward sloping one with age for both men and women
- tends to be positively associated with education for both men and women
- tends to be higher among residents of urban as opposed to rural areas (substantially so for women).

Among 15 to 19 year olds, the probability of having ever had sexual intercourse:

- is always increasing in age
- tends to be negatively related to education (except for men in Haiti, where it is increasing with education, and for women in Burkina Faso, CAR, and Côte d'Ivoire, where the relationship is flat).

Other results are less consistent across the different countries:

- Education is not systematically related to the probability of having had a non-regular partner. In Kenya, Tanzania, Uganda, and Zimbabwe this probability and education are related differently for women in urban and rural areas: the relationship tends to be positive for rural women and negative for urban women. In those countries, the relationship is insignificant for men. In Burkina Faso, CAR, and Côte d'Ivoire, the relationship between education and sex with a non-regular partner is positive.
- Although occupation tends to be significantly related to both the probability of having had a non-regular partner and having used a condom with that partner, the specific occupation groups with the highest likelihoods vary across countries and genders.
- The likelihood of having ever had sex for 15 to 19 year olds is not systematically related to urban-rural residence for either men or women.

This paper set out to answer the question: What are the socioeconomic correlates of sexual behaviours that increase or decrease the risk of HIV/AIDS infection for women and men? The analysis has shown that the answer to this question varies substantially across the countries studied. In terms of targeting population by age, education, or residence, the results show that it is the interaction between various dimensions of behaviour that matters: those that are more at risk (by having more non-regular partners) may already undertake actions to mitigate that risk (by using condoms with those partners). [A clearer finding, relevant for policy, is that although in many of the samples the probability of having had a non-regular partner increases with educational level, the probability of using a condom increases at a faster rate.]

Appendix

Appendix Table 1. Definition of 'sexual intercourse with a non-regular partner'

Country	Definition: Dependent variable equals one...	Reference period	% responding yes
Brazil (NE) 1991	If they are married or living with a partner then it is equal to one if the number of partners in the *past month* is greater than one. If they are not married or living with a partner then it equals one if the number of partners in the *past month* is greater than zero. As the male sample is one of husbands only, it is equal to one if the number of partners in the *past month* is greater than one.	1 month	women 6.0 husbands 8.0

(Table continues on next page.)

Appendix Table 1 *(continued)*

Country	Definition: Dependent variable equals one…	Reference period	% responding yes
Burkina Faso 1993	If they are married or living with a partner, then it equals one if the number of partners in the *past two months* is greater than one (for women) or greater than the number of wives (for men).	2 months	women 1.5 men 23.1
CAR 1994–95	If they answered yes to 'Have you had sex with anyone other than your husband [wife] in the *last four weeks*?' for married respondents or 'Have you had sex with anyone in the *past four weeks*?' for non-married respondents.	1 month	women 10.7 men 24.8
Côte d'Ivoire 1994–95	If they are married or living with a partner, then it equals one if the number of partners in the *past two months* is greater than one (for women) or greater than the nuxmber of wives (for men).	2 months	women 13.5 men 22.6
Haiti 1994–95	If they have had any sexual relations with occasional partners in the *past 12 months* (this is defined for the sample of men only).	12 months	men 13.0
Kenya 1993	If the respondent is married or living with a partner, then it equals one if the number of partners in the *past six months* is greater than one (for women) or greater than the number of wives (for men).	6 months	women 14.7 men 39.0
Tanzania 1994	If they answered yes to the question 'Have you had sexual intercourse with anyone (else) in the *last 12 months*? (I mean with someone other than your husband or regular partner).'	12 months	women 5.8 men 25.2
Uganda 1995	If they reported one or more non-regular partners in the *past six months.*	6 months	women 2.6 men 14.4
Zimbabwe 1994	If they answered yes to 'Have you had sex with anyone other than your husband [wife] in the *last four weeks*?' for married respondents or 'Have you had sex with anyone in the *past four weeks*?' for non-married respondents.	1 month	women 6.1 men 16.4

Appendix Table 2. Definition of 'condom use with a non-regular partner'

Country	Definition: Dependent variable is equal to one if, among those with a non-regular partner...	% responding yes
Brazil (NE) 1991	If they report having ever used a condom in the past month (including with the respondents' regular partner).	women 7.5 husbands 22.0
Burkina Faso 1993	If they report ever having used a condom during the past two months (including with the respondents' regular partner).	women 37.5 men 58.2
CAR 1994–95	If they report having used a condom on any of the occasions of sexual intercourse with a non-regular partner.	women 24.5 men 37.0
Côte d'Ivoire 1994–95	If they report ever having used a condom during the past two months (including with the respondents' regular partner).	women 16.9 men 43.4
Haiti 1994–95	If they report ever or sometimes using a condom to avoid getting or transmitting AIDS.	men 50.8
Kenya 1993	If they report ever having used a condom during the past two months (including with the respondents' regular partner).	women 12.9 men 34.9

Country	Definition: Dependent variable is equal to one if, among those with a non-regular partner...	% responding yes
Tanzania 1994	If they report having used a condom during the last sexual intercourse with a non-regular partner.	women 18.4 men 35.2
Uganda 1995	If they report having used a condom on any of the occasions of sexual intercourse with a non-regular partner.	women 8.8 men 20.0
Zimbabwe 1994	If they report having used a condom on any of the occasions of sexual intercourse with a non-regular partner.	women 37.6 men 57.7

Note

1 The author thanks Martha Ainsworth, Kathleen Beegle, Michel Caraël, Paul Gertler, Susan Jayne, and Lant Pritchett for valuable comments. The findings, interpretations, and conclusions expressed in this paper are entirely those of the author. They do not necessarily reflect the views of the World Bank, its Executive Directors, or the countries they represent.

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8

Socioeconomic determinants of sexual behaviour and condom use

by Jean-Claude Deheneffe, Michel Caraël, and Amadou Noumbissi

Section One: Introduction

Economic insecurity, poverty, inequality, low educational level, and social stigma are powerful determinants of morbidity and mortality. The role of socioeconomic determinants of HIV risk behaviours is still largely unexplored, although it is recognised that along with the social and economic changes that have occurred in developing countries in communication, education, urbanisation, and migration, patterns of sexuality have also changed (Tawil, Verster, and O'Reilly 1995). The few studies that have shown the importance of such factors largely concentrate on sex workers and have generally ignored the so-called general population amid the increasing evidence that heterosexual transmission of HIV is still growing rapidly in many parts of the world (Ford and Koetsawang 1991).

In the search for improved understanding of the social context of sexual risk behaviour and exposure to HIV, we present a study on the socioeconomic correlates of risky sexual behaviour across 12 countries/sites.

- First we describe the data source and the dependent and independent variables used in the analysis.
- Then we examine the results of the multivariate analysis.
- A discussion will close this analysis.

Section Two: The data

2.1 Data source and study population

The Global Programme on AIDS (GPA) of the WHO launched in 1988 a programme of surveys to provide basic descriptive information about the knowledge, attitudes, beliefs, and sexual behaviour of general populations as they relate to the risk of HIV infection (WHO/GPA 1988a, 1988b). The GPA surveys were intended to contribute to a better understanding of the links between sexual behaviour and key factors, such as age, gender, education, marital status, and residence. An implicit expectation was that, as in other social fields, such as reproduction, family planning, or health seeking behaviour, these key socio-demographic factors will influence sexual behaviour in similar ways across cultural boundaries.

The primary goal was to facilitate, improve, and evaluate HIV/AIDS prevention control activities. The surveys selected in this study were carried out between 1989 and 1991 using WHO/GPA protocols.

The data used here stem from 12 sample surveys of general populations aged 15–49 years out of 18 GPA surveys. Eight of these were nationwide surveys while the remaining four were restricted to capital cities. Seven were located in sub-Saharan Africa, four in Asia, and one in South America. The surveys were conducted by teams of national investigators in 1989–91 in collaboration with, and with the support of, the GPA. The detailed survey methodology is described elsewhere (Caraël and others 1991; Cleland and others 1992; Cleland and Ferry 1995; Caraël and others 1995).

2.2 Non-regular partnerships

In order to measure the occurrence of sexual contacts outside marriage or non-marital sex, careful consideration had to be given to the definition of marriage itself. The approach in the GPA surveys was to use a broad definition, such as to include any sexual relationship that had lasted for a year or more, or was of more recent origin but was expected to continue for at least this period of time. All sexual relationships of less than one year were classified as non-regular. Conversely, any sexual relationship of more than one year is called 'regular'. All married sex partners are considered 'regular' even when the duration of the marriage was less than 12 months. Nonmarital sex is equivalent to 'non-regular'.

2.3 Commercial sex

In many societies, it is extremely difficult to enforce a clear-cut distinction between contacts with sex workers and other non-regular contacts, because economic transactions may underpin many different types of relationships. In the GPA surveys, an admittedly oversimplified approach was used by asking respondents whether they had exchanged gifts or money in return for sex in the preceding year.

2.4 Condom use

Condom use with a non-regular partner in the last four weeks was defined as 'each time' and 'sometimes' use.

2.5 Reported symptoms of STDs among men

To measure STD occurrence among men, the indirect approach was used by asking questions about the most common symptoms, i.e., discharge from the penis and/or sores on the genital or anal area.

2.6 The data

The data themselves are presented for men and women in table 1. Among the 12 surveys, the proportion of men reporting nonmarital sexual contact in the

Table 1. Sample size and descriptive statistics for the dependent variables, by gender

		BUR	CAR	CI	TAN	KEN	LES	LUS	MAN	THAI	RIO	SING	SL
Any non-regular partners in last 12 months													
Men	N	85	173	651	589	333	217	227	84	317	274	99	64
	%	7.5	14.4	50.7	32.2	30.7	43.7	25.8	14.7	28.2	44.3	9.8	4.3
Women	N	25	63	185	339	181	184	68	11	29	71	6	40
	%	2.3	5.5	13.4	14.5	12.2	19.1	6.8	1.2	1.7	9.8	0.5	2.7
Commercial sex in the last 12 months													
Men	N	41	154	121	452	107	83	194	32	263	40	76	23
	%	3.6	12.8	9.4	24.7	9.9	16.7	22.0	5.6	21.0	6.5	7.6	1.5
Women	N	3	55	107	267	77	118	55	1	16	1	1	11
	%	0.3	4.8	7.8	11.4	5.2	12.2	5.5	0.1	0.9	0.1	0.1	0.7
Non-regular partners in the last 4 weeks													
Men	N	32	67	328	195	140	111	125	24	129	114	18	37
	%	2.8	5.6	25.6	10.7	12.9	22.4	14.2	4.2	11.5	18.4	1.8	2.5
Women	N	5	23	44	63	67	123	20	2	5	18	1	11
	%	0.5	2.0	3.2	2.7	4.5	12.7	2.0	0.2	0.3	2.5	0.1	0.7
Condom use with non-regular partner in the last 4 weeks													
Men	N	10	24	105	30	45	47	47	7	72	25	7	–
	%	0.9	2.0	8.2	1.6	4.2	9.5	5.3	1.2	6.4	4.0	0.7	–
Women	N	1	8	7	14	10	26	2	0	0	4	1	–
	%	0.1	0.7	0.5	0.6	0.7	2.7	0.2	0.0	0.0	0.6	0.1	–
Symptoms of STD in the last 12 months													
Men	N	–	–	146	114	139	98	–	–	–	–	–	–
	%	–	–	11.4	6.2	12.8	19.8	–	–	–	–	–	–
Size of the sample													
Men	N	1,139	1,202	1,283	1,830	1,083	496	880	572	1,126	618	1,006	1,492
Women	N	1,109	1,155	1,377	2,336	1,482	965	1,000	883	1,675	723	1,109	1,487

N Sample size.
– Not available.
Note: BUR=Burundi; CAR=Central African Republic; CI=Côte d'Ivoire; TAN=Tanzania; KEN=Kenya; LES=Lesotho; LUS=Lusaka, Zambia; MAN=Manila, the Philippines; THAI=Thailand; RIO=Rio de Janeiro, Brazil; SING=Singapore; SL=Sri Lanka.

last 12 months ranged from 4.3 per cent (Sri Lanka) to 50.7 per cent (Côte d'Ivoire). Among females, the corresponding values varied from 0.5 per cent (Singapore) to 19.1 per cent (Lesotho).

The proportion of men reporting exchange of gifts or money in return for sex ranged from 1.5 per cent (Sri Lanka) to 24.7 per cent (Tanzania). Among females, the proportion varied from 0.1 per cent (Manila, Rio de Janeiro, and Singapore) to 12.2 per cent (Lesotho).

In the years 1989–91, the proportion of sexually experienced men who had ever used a condom varied from around 12 per cent in Sri Lanka and 14 per cent in Tanzania to 52.3 per cent in Thailand and 65.8 per cent in Singapore. Concerning the use of condoms with a non-regular partner in the last four weeks, the percentages varied from 0.7 per cent (Singapore) to 9.5 per cent (Lesotho) for the men and from 0 per cent (Manila and Thailand) to 2.7 per cent (Lesotho) for the women.

The proportion of sexually active men reporting discharge or sores in the last 12 months was about 10 per cent in most sites.

2.7 The independent variables

The last set of variables pertained to individual socioeconomic characteristics: age, level of education, residence, and occupation. The GPA data do not contain information on spouse respondent's characteristics, and unfortunately, in most study sites, it was impossible to link information collected on cluster characteristics with individual questionnaires because cluster identification was not coded. In the 'occupation' variable,

- blue collar includes drivers, manual workers, miners, machine operators, craftsmen, traders, and the self-employed
- white collar includes sales services, clericals, professionals, teachers, administrators, religious people, medical people, etc.

Section Three: Multivariate analysis

All the data were analysed by using SPSS/PC+. Logistic regression was performed on a set of socio-demographic variables selected for their importance for analysis. The logistic regression estimates the probability of an event occurring. Three models were tested using the regression technique:

- Model 1 included age dummies, education dummies, and a dummy variable for urban and rural residence, except in Rio de Janeiro, Manila, Lusaka, and Singapore, where the samples were drawn in the cities.
- Model 2 was built on the first model by allowing for the possibility that the relation with education differs between urban and rural areas: this was done by interacting the education dummy variables with a dummy for urban residence. This model was not used for data sets that are exclusively from urban areas.
- Model 3 added to specifications (1) and (2) a series of dummy variables for the respondent's occupation (white collar, blue collar, farmers – the comparison group – unemployed, and other). As we expect that education is correlated with occupation, the inclusion of occupation variables should affect the magnitude of the education variables.

3.1 Dependent variables

For the four dependent variables, logistic regressions were used.

- Ages were grouped into 7 classes: 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49 years old. The 15–19 class is the reference category.
- Education was grouped into: no school, lower primary, higher primary, partial secondary, completed secondary, and higher school, including

university. Because of the small sample size varying from one country to another (we consider 100 as the smallest acceptable number in order to reduce the problems due to small sample size), some levels were grouped. No schooling was taken as the reference category.

- Rural residence (the reference) was compared to urban residence.
- For the interaction between education and residence, rural residents (with no distinction of education) were compared to urban residents according to educational level.
- For occupation, farmers and fishermen were taken as the reference category.

Section Four: Multivariate results

The socioeconomic correlates of risk behaviour were only assessed among men, except for the dependent variable on non-regular sexual relationships, where men and women were treated separately.

4.1 Non-regular partnerships in the last year

The results for men show, as expected, that age has a generally important effect on non-regular partnerships. The risk of non-regular sex usually peaks among respondents aged 20 to 24 years and decreases after that. In Burundi, Singapore, and Sri Lanka, countries with late age at first sexual intercourse, the peak of risk is further delayed among the 25–29 and even the 30–34 year olds. In Lesotho, the prevalence of non-regular sex increases linearly with age. [In five of the 10 sites, educated men have significantly higher risk behaviour than uneducated men. In two other sites, namely Thailand and Rio de Janeiro, the trend is also present but the association is not significant.] In Lesotho and Sri Lanka, surprisingly, the association is in the opposite direction: uneducated men have a higher prevalence of non-regular sexual relations than educated ones.

The association between higher prevalence of nonmarital sex and urban residence is significant in four of the eight sites studied. In the other sites, urban-rural differences are not strongly marked.

When the interaction between education and urban residence is added to the model, the separate effect of education and residence is not removed but is diminished.

Finally, when added to the basic model, the occupation variable is only significant in two of nine studied sites and does not substantially change the relative odds of the other explanatory variables. In Burundi and Thailand, farmer occupation is associated with low prevalence of sex with non-regular partners as compared to all other occupational categories.

A similar analysis was also performed for women in seven African sites and Rio de Janeiro. In the other five sites, sample sizes were too small to conduct multivariate analysis. As for men, the largest influence on female prevalence of non-regular partnerships is age. Young ages show the highest prevalence in most study populations and among older ages the decline is sharp. In Lesotho, the odds of nonmarital sex increase moderately up to ages 25 to 29 and then stay more or less stable.

Higher educational level is significantly associated with higher risk behaviour in two sites and the strength of this relationship does not vary much throughout the three models.

The effect of rural residence in lowering the prevalence of nonmarital sex is significant in three out of five study populations, but seems rather modest.

The occupational categories are significantly associated with risk behaviour in four out of seven sites, with blue- and white-collar workers having higher risks as compared to farmers. This effect is the most important in Central African Republic and Côte d'Ivoire.

4.2 Commercial sex in the last year

The analysis of commercial sex is restricted to men because the prevalence among women was too low in most study sites. Again, age is the most important covariate of commercial sex in five out of eight sites. In Lusaka, Kenya, Tanzania, and Thailand, the prevalence of commercial sex is the highest among youth aged 20 to 24 years. In Lesotho, the odds of commercial sex are increasing linearly with age. In Lesotho and Singapore, the odds stay relatively constant across ages. Higher educational level is associated with higher prevalence of commercial sex in four out of seven study sites. Even a modest achievement in schooling is significant in increasing odds in Lusaka and Kenya. However, when the interaction effect with urban residence is taken into account, and the occupational categories are added to the basic model, the separate effect of education on relative odds is no longer significant.

As expected, in the majority of the study sites, rural residence is associated with lower levels of commercial sex, but not in Côte d'Ivoire and in Kenya. The effect of urban residence is much smaller when the interaction with education is added to the model.

[Occupational categories, such as white collar in Central African Republic and Thailand, are positively associated with higher probabilities of commercial sex, and as is unemployed in Tanzania. In three other sites, no association is found.]

4.3 Condom use with non-regular partners

For those male respondents who reported sexual relationships with a non-regular partner in the last four weeks, increasing age and educational attainment are not significantly associated with condom use, except in Côte d'Ivoire and Kenya.

As expected, urban residence is associated with higher condom use in three out of five sites. Other factors included in the model, such as the interaction between education and urban residence and occupation, do not emerge as predictors of condom use with a non-regular partner in the last four weeks, except in Côte d'Ivoire. However, the significance of this multivariate analysis is to be treated with caution because it is estimated on the basis of reduced samples.

4.4 Prevalence of STD symptoms

The proportion of sexually active men who reported symptoms of genital discharge and/or sores in the last year is only available in four population sites.

Current age has a significant positive effect on reported symptoms of STDs. Generally, STD symptoms are more likely among young adults – 20–29 year olds – except in Kenya, where the probability is highest at intermediate ages. Educational level does not influence significantly the STD variable, and as expected, urban residence is associated with higher prevalence of symptoms than rural residence in two out of four sites.

Occupational categories seem to affect significantly the prevalence of STD symptoms but in two opposite directions. In Tanzania, the probability of reporting symptoms is higher among farmers than among all other occupations. In contrast, in Kenya, the farmers have the lowest probability compared to the other groups. In Côte d'Ivoire and Lesotho, no significant association is found.

Section Five: Predicted probability of risk, by study site

The predicted probability of having non-regular partners in the last 12 months by age group and by educational level for men and women is shown for each study site in figures 1–12. The probabilities of non-regular sex are always higher for men than for women. The age profile is as expected for both genders in most sites, peaking between ages 20 to 29 for men, a little earlier for women, then declining sharply or smoothly according to each site. Men in Burundi and Sri Lanka do not follow this pattern in the sense that the peak is more around 30, reflecting probably delay in age at first sexual intercourse.

More surprisingly, in Lesotho, probabilities increase with older age for both genders. Lesotho is a country where 60 per cent of the male labour force is usually absent from home to work in the Republic of South Africa. Extramarital sexual relationships increasing with age may be linked to labour migration. Finally, in Rio de Janeiro, the peak of non-regular sexual relations is around 15 years old for male and female youths.

The educational profiles for men in most sites reflect higher probability of risk behaviour with higher schooling level. Lesotho emerges again as an outlier, with higher probabilities associated with no schooling. A similar pattern is found in Sri Lanka, whereas in Singapore the highest probability is associated with primary schooling. Among women, there are no clear patterns emerging and the profile is very heterogeneous.

The predicted probabilities of commercial sex in the last month, by age and level of schooling, were examined in eight study sites, for men only. In most surveys, the probabilities are highest between ages 20 to 24 and decline after. In the two Asian surveys, there seems to be a trend toward increasing probabilities with increasing ages. No clear pattern emerges when probabilities are scrutinised according to educational level.

Predicted probabilities of using condoms with a female non-regular partner in the last four weeks were examined, by age and level of schooling. Surprisingly, age does not play any major role in those probabilities, and as expected, higher education is associated linearly with increased probability of using condoms. Even though the results are statistically significant only for Côte d'Ivoire, the relation between male education and condom use is universally positive, except for Lesotho.

Also for men only, and only in four sites, the predicted probabilities of reporting STD symptoms in the last 12 months were examined, by age and education. The trends are unclear but seem to show an inverse U curve according to higher age. Higher education seems to be correlated with lower probabilities – but not in Kenya – probably reflecting the combination of lower commercial sex and higher condom use, as seen before.

Section Six: Discussion

In broad terms, intercountry differentials in the prevalence of sexual contacts outside regular partnerships are pronounced and largely inadequately explained by the few covariates used in the multivariate analysis. This is probably an indication that in sexuality, many traditional customs persist and that ethnic and cultural diversities are probably more important than differentials associated with a few selected indicators of modernisation.

Urban residence

The capital cities – and in general, urban residence – are associated with higher prevalence of nonmarital sex, sex in exchange for money, reported symptoms of STDs, and condom use. However, after controlling for interaction with education and occupation, urban-rural differences are generally less pronounced than expected.

Nonmarital sex

Nonmarital sex is most common among young adults in their early twenties. Typically, the occurrence of nonmarital contacts declines after the age of 25 years, most probably in interaction with marital status. In some Asian populations, postponement of sexual initiation is pronounced and so thereafter is the frequency of nonmarital sex.

Education

Educational attainment is positively associated with the prevalence of non-regular partnerships among men but not in all study populations. In Asian study sites, the relationship is inverse. It is striking that the effect of schooling is not a linear one and should be understood within particular sexual behaviour cultures. The effect of higher education on nonmarital sex, including commercial sex, may reflect the higher incomes of better-educated men and the increased possibility of sustaining and/or accumulating sexual relations and/or the influence of schooling on sexual values and attitudes. Or it may reflect a greater exposure to risk: the educated usually experience a longer span between age at first sex and their first stable partnership.

Occupation

The strength of association between occupation and nonmarital sex, including commercial sex, varies greatly between specific locations. In some cultures, an occupation that generates for men monetary income seems to favour sex in exchange for money and to increase the frequency of STD symptoms. In other cultures, no association is found.

Condoms

Age and education have only a minor effect on male condom use, but we should remember that these surveys were conducted in 1989–91, or at a time when, in many study populations, condom use was very low.

Section Seven: Some implications

Priority interventions

In terms of identifying specific priority groups for interventions, one clear message from this analysis is the need to address the reproductive health needs of young people. Regardless of political or religious opposition, it seems essential that safer sex education be taught to young people in and out of school. The findings of higher-risk behaviours in persons with higher educational levels and, in some settings independently, with higher income have clear implications for estimating the economic impact of AIDS.

early age also w/ women.

Methodology

More refined measures and additional research are needed to create a better framework to study social and economic correlates of sexual behaviour and condom use. A multilevel design is clearly called for. On the one hand, analysis at the macro level is too large-scale and presumes homogeneity of institutional or community features thought to be crucial in imparting variance in sexual behaviour. On the other hand, the purely individual-level survey reveals little about the institutional and cultural environment surrounding the household. Better measurement of macro characteristics is probably more possible at the community level.

So future research on the structural determinants of sexual behaviour should tend toward the comparative analysis of selected communities. This could take the form of clustered samples where, on the one hand, detailed community-level data on social and economic organisation and, on the other hand, individual- and family-level data on sex behaviour and socioeconomic activities are collected.

At the individual level, explanatory variables assessing such social factors as non-cohabitation, in- and out-migration, social status in the household, and marital status should be documented and included in the multivariate analysis of nonmarital sex.

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Figure. 1 Burundi

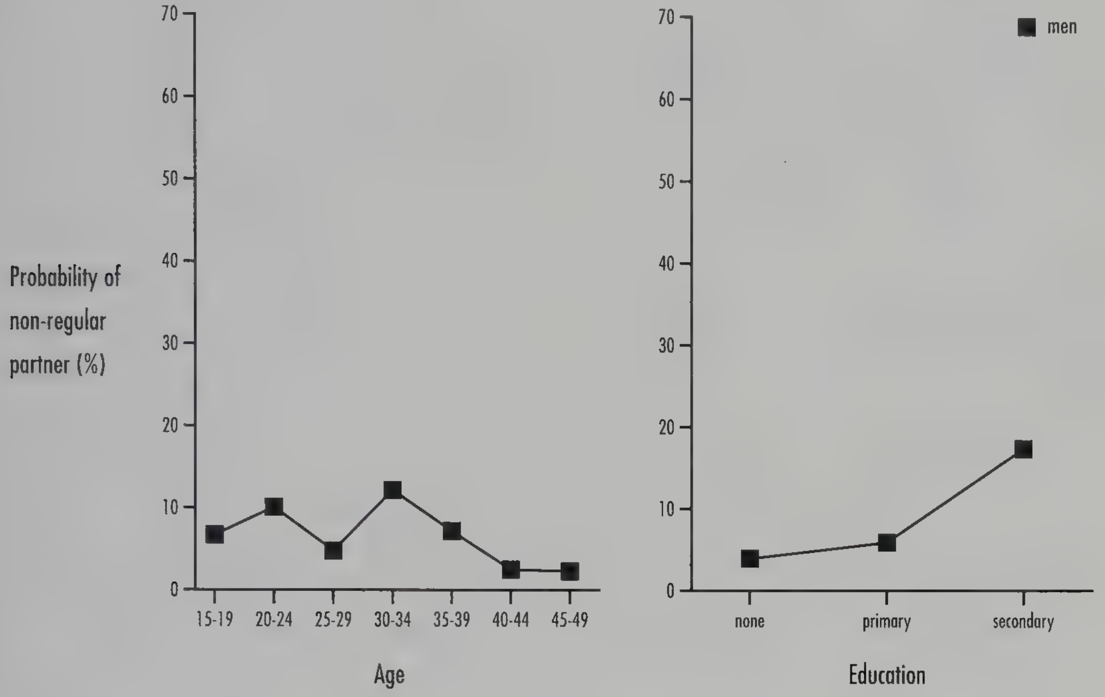


Figure 2. Central African Republic

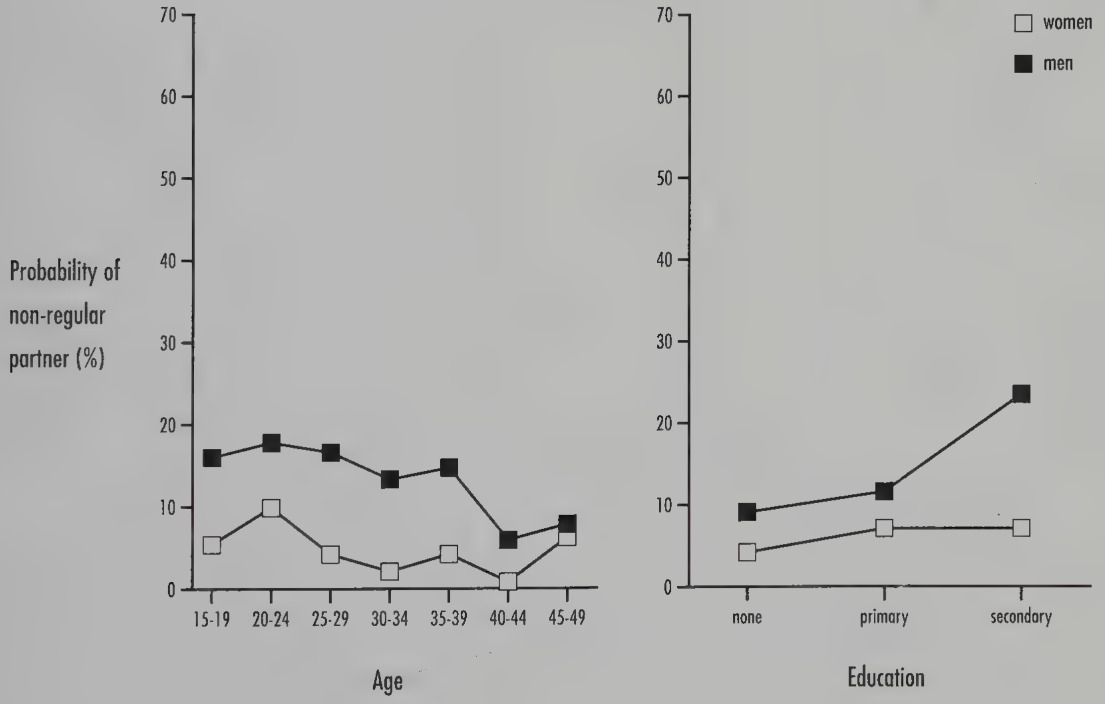


Figure 3. Côte d'Ivoire

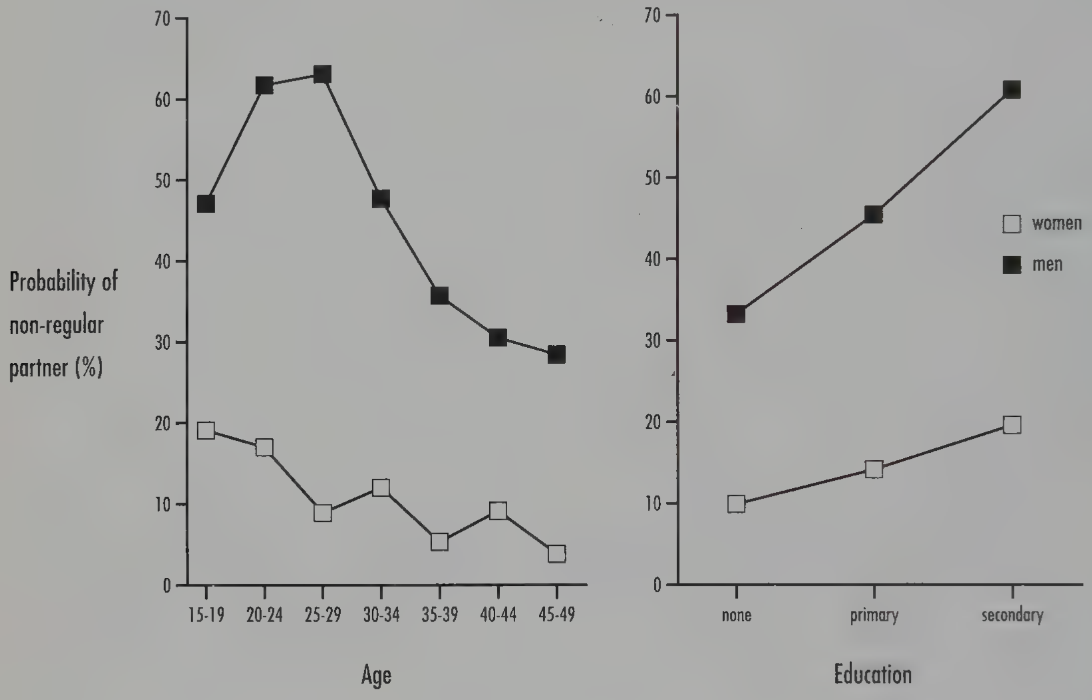


Figure 4. Tanzania

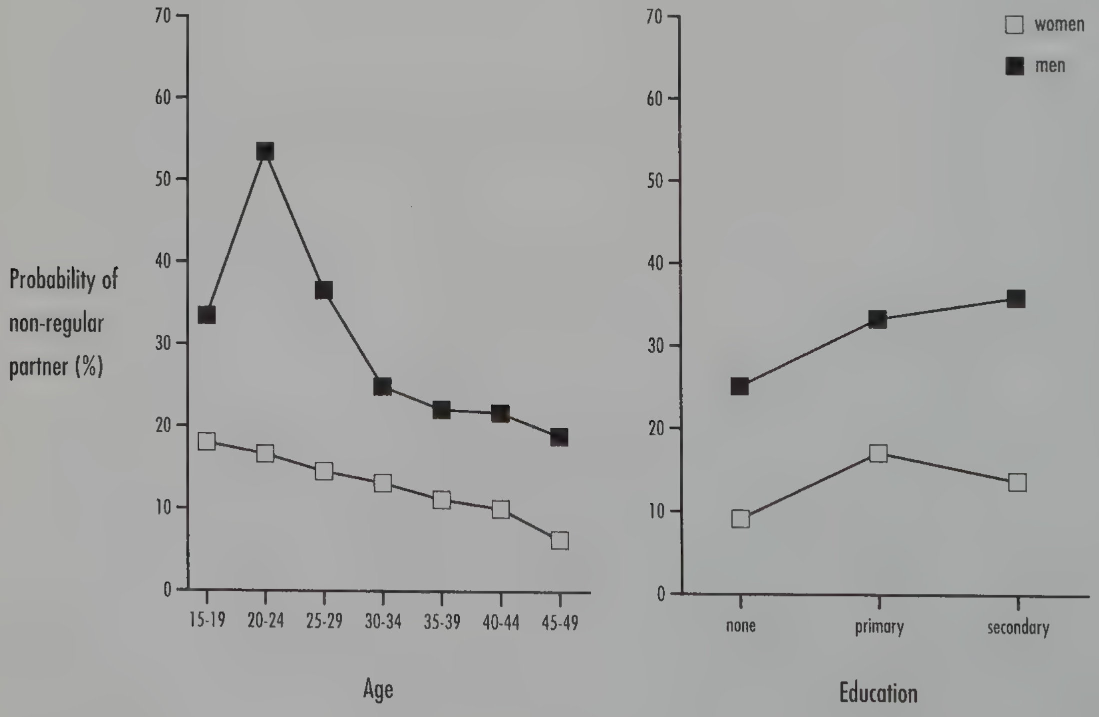


Figure 5. Kenya

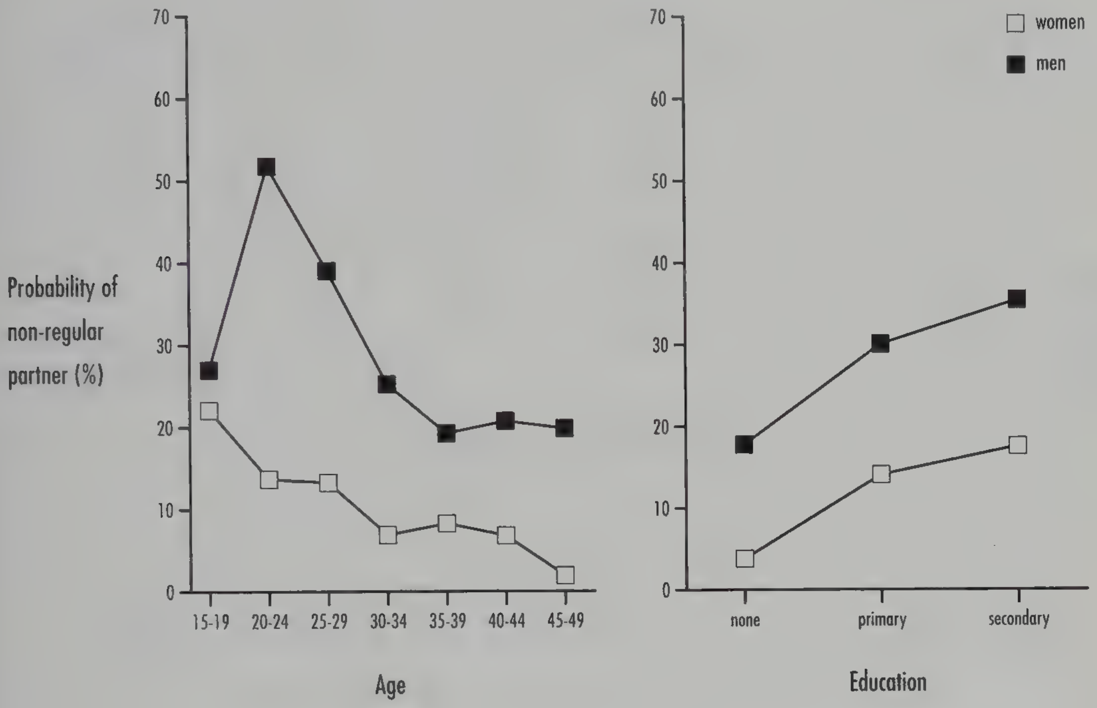


Figure 6. Lesotho

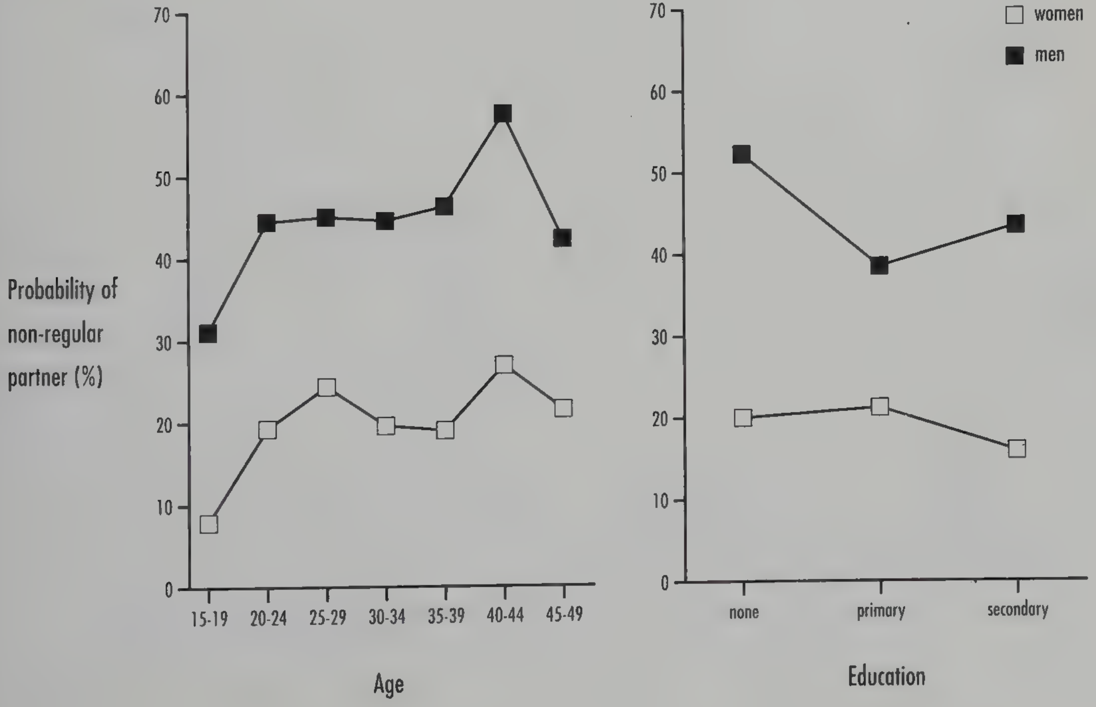


Figure 7. Lusaka, Zambia

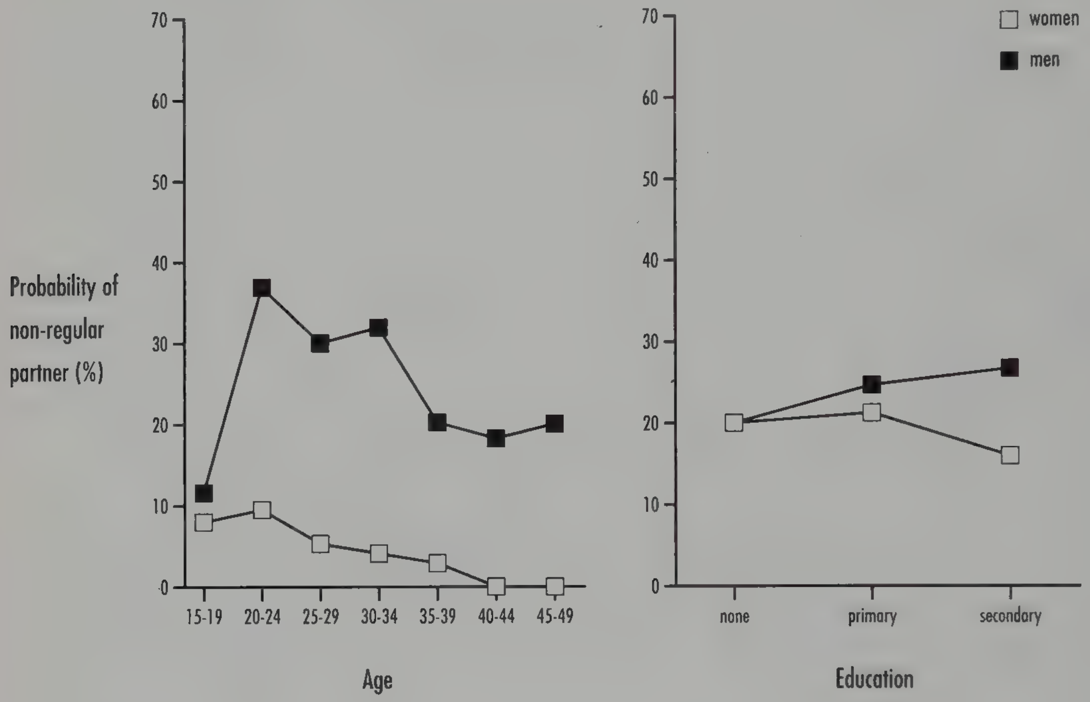


Figure 8. Manilia, the Philipines

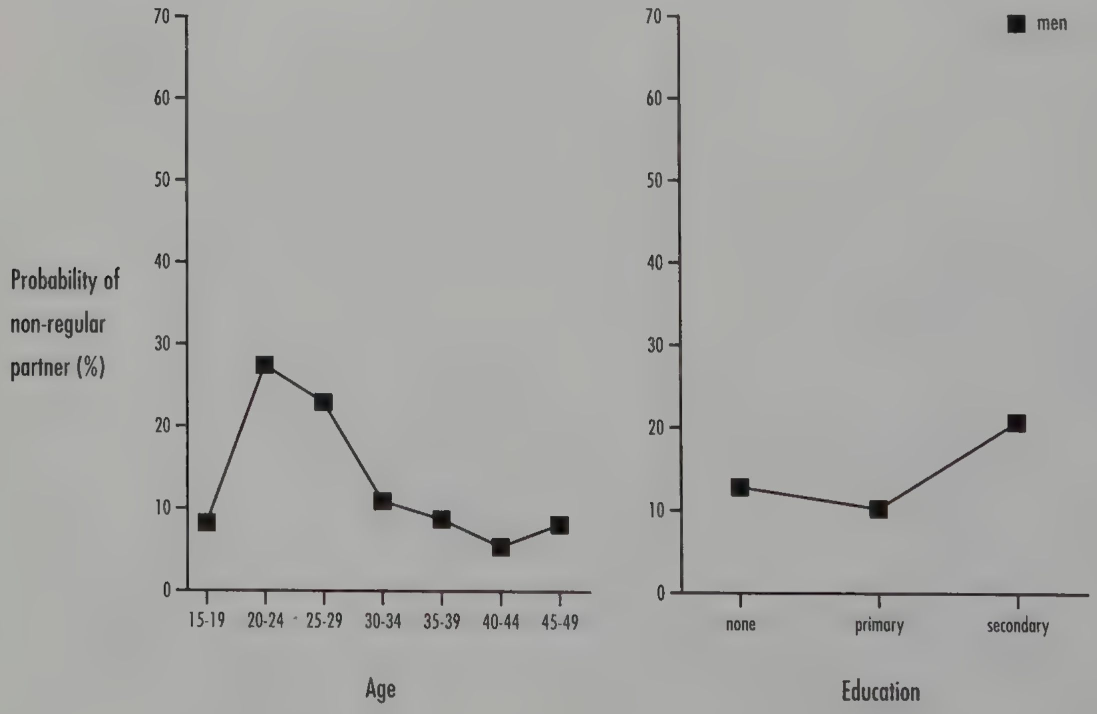


Figure 9. Thailand

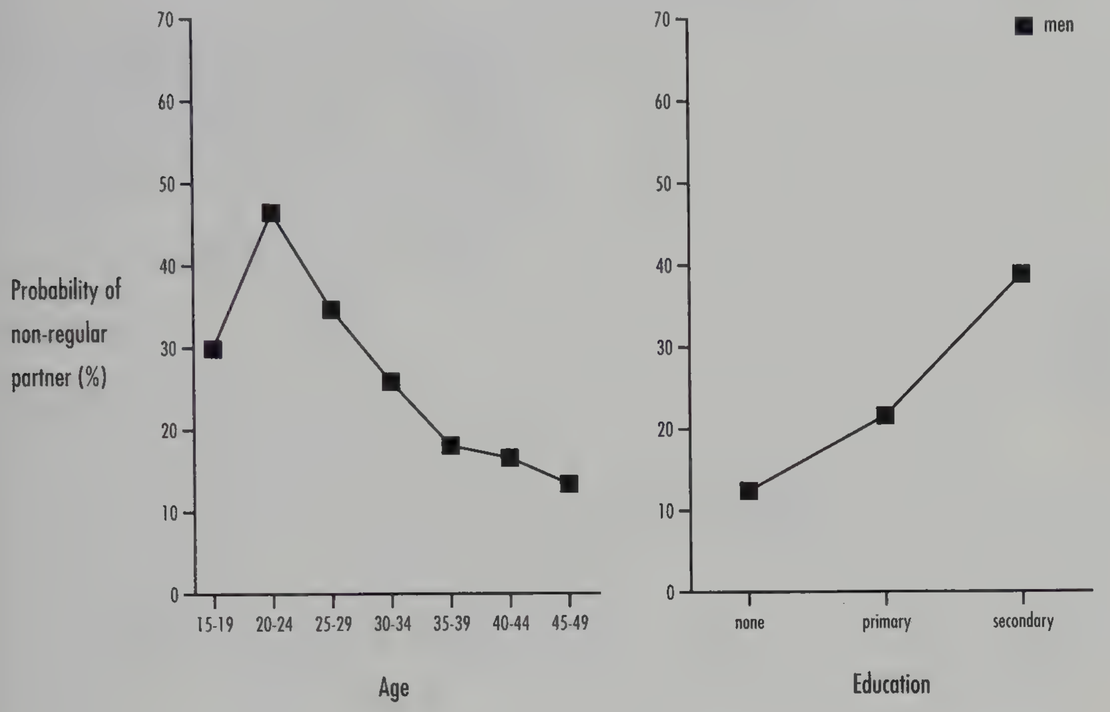


Figure 10. Rio de Janeiro, Brazil

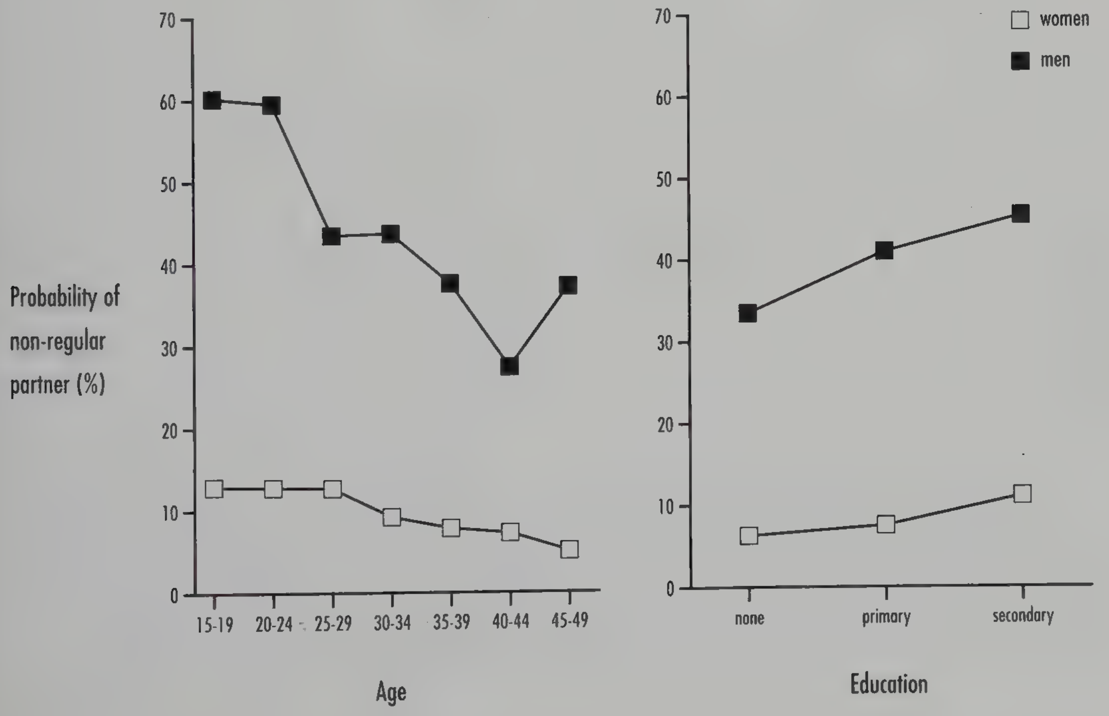


Figure 11. Singapore

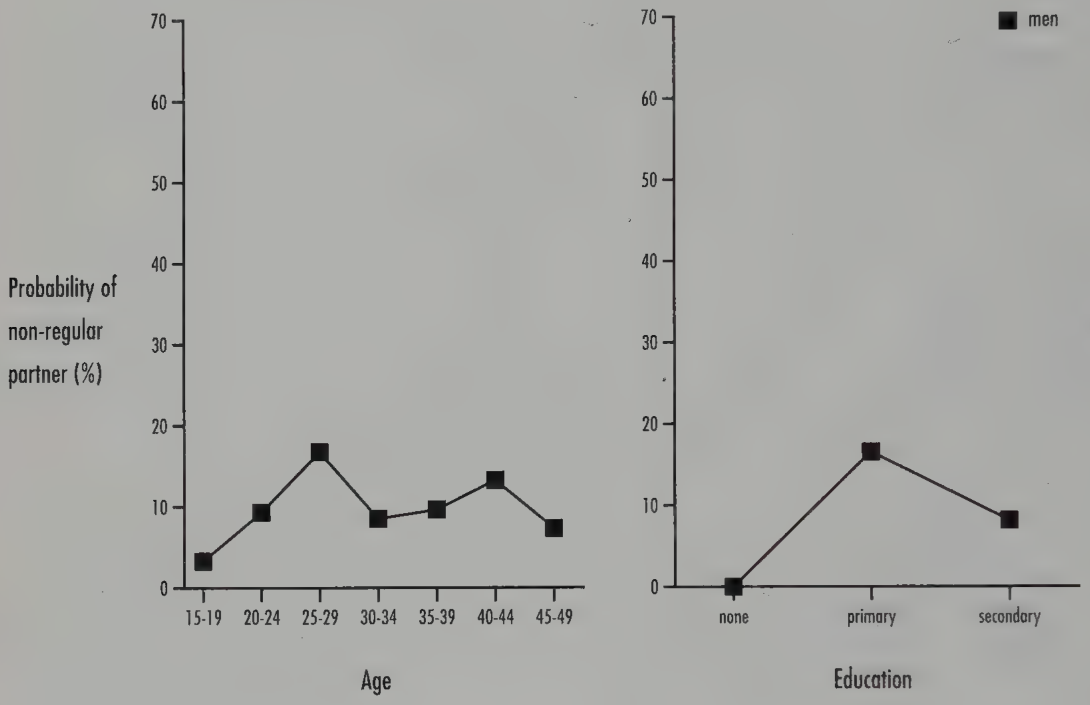
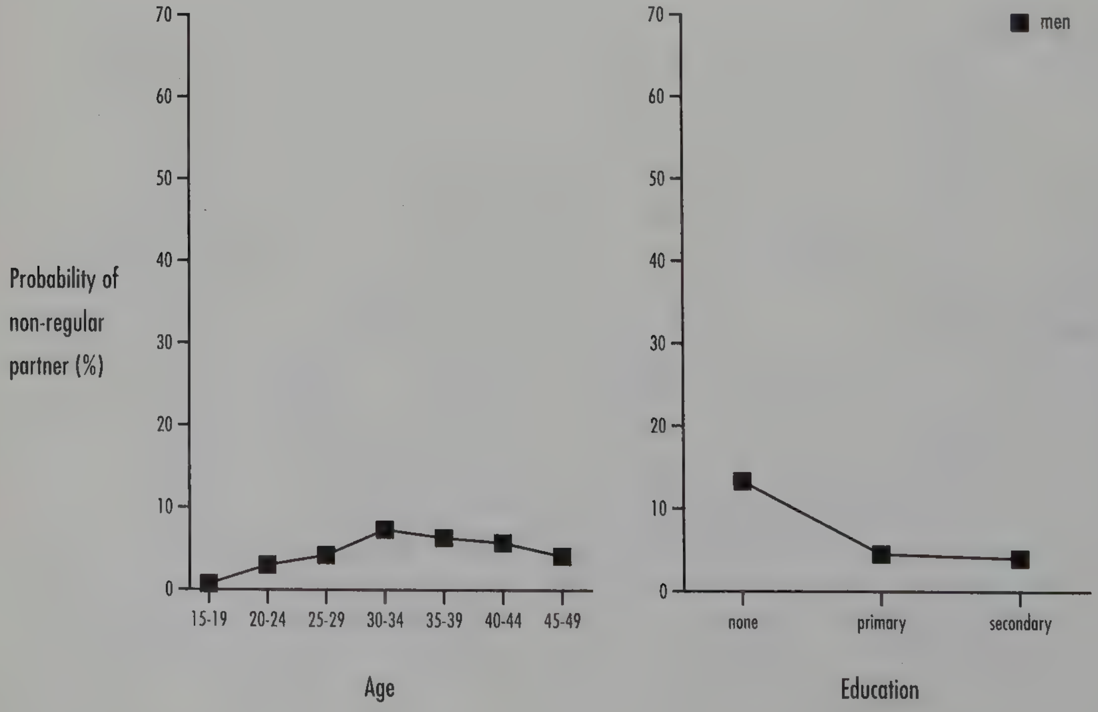


Figure 12. Sri Lanka



9

The economics of the commercial sex industry

by Dennis A. Ahlburg and Eric R. Jensen

Section One: The demand for commercial sex

Commercial sex is 'the sale of sexual intimacy' (Reynolds 1986). Commercial sex is a service and the non-price determinants of the demand for commercial sex are the same as for other commodities or services: the number of potential consumers, their preferences and incomes, the prices of other commodities and services, and perhaps their expectations of future prices and income.

1.1 Number of consumers

Since males, particularly single or divorced males, are the main demanders of commercial sex, an increase in their numbers can increase the demand for commercial sex. An increase in the numbers of postpubertal males can occur for a number of reasons, including high median age at marriage, prolonged postpartum abstinence, and migration.

A number of factors can lead to a high median age at marriage, which creates a large potential demand for commercial sex. One important factor in increasing median age at marriage is polygyny, which is common in much of West and Central Africa. In these regions 40 per cent to 50 per cent of married women are in polygynous marriages. Consequently, men marry 10 years later than women and at any time 50 per cent of postpubertal males have never married (Caldwell et al 1993).

In those countries in which bride-price must be paid, high bride wealth payments delay marriage for men and encourage high rates of prostitution (Caraël et al 1987). In those parts of Asia that have been developing rapidly, rapid increases in education and school enrolment have accounted for increases in the median age at marriage (Hirschman 1985; Brien and Lillard 1994). Where sex outside of marriage for males is sanctioned, these increases in education and median age at marriage have increased the demand for commercial sex.

In much of sub-Saharan Africa there is a prohibition on female sexual activity during pregnancy and for long periods after the birth of a child.

Postpartum sexual abstinence exceeds one year in most countries and is frequently as high as two years or more. In Ghana, Anarfi (1993) found that 67 per cent of male respondents had sex with girlfriends and 16 per cent had sex with prostitutes when their wives were lactating. In the sample, 25 per cent of men and 7 per cent of women currently had two or more sexual partners, and 60 per cent of males and 73 per cent of females did not use condoms. To decrease the demand for non-regular sex from these causes would entail 'massive change in the nature of spousal relationships' (Caldwell et al 1993). Family planning programmes can play a role here by promoting contraception as a substitute for postpartum sexual abstinence but in some countries they must confront strong cultural taboos about sex after giving birth.

Migrant workers increase the demand for nonmarital sex because they are separated from their wives (supply of marital sex), their behaviour is not easily monitored by their families and communities, they often have considerable amounts of cash to spend, and they are lonely (Bloom and Mahal 1995). Ahlburg and Jensen (1997) found that Filipino men who were living away from their wives were 4 percentage points more likely to have extramarital sex than men who are living with their wives, controlling for other determinants of extramarital sex. Sex-selective migration can result in very unbalanced sex ratios, which can lead nonmarital sex to take the form of commercial sex and can increase rates of HIV infection.

For example, selective migration by males in Papua New Guinea has resulted in the capital, Port Moresby, having 125 men for each 100 women. Lae, the second largest city, has 130 men per 100 women. In the mining community of Tabubil, there are 150 men per 100 women (UNDP 1996). In a cross-national study of urban areas, Over and Piot (1993) found that seroprevalence rates are higher in urban areas in which there are many fewer young adult women than men and that this relationship is even stronger for the seroprevalence rate of prostitutes. Another study found that the two West African cities with the highest sex ratios, Abidjan and Dakar, are the two urban areas with the highest HIV levels (Caldwell et al 1993).

Isolated development sites, such as mining camps, also are generally associated with in-migration of males, unbalanced sex ratios, and demand for commercial sex. Unbalanced sex ratios in urban and mining areas in Africa and elsewhere are often blamed on colonial regulations. Their persistence far beyond colonial rule suggests to Caldwell et al (1993) that more basic social processes are at work and that the unbalanced sex ratios can only be overcome by changes in cultural attitudes and by the creation of employment opportunities for women (other than sex work). Urbanisation may increase demand by lowering the cost of finding multiple sexual partners (Philipson and Posner 1995). To the extent that these partners are commercial sex workers or casual sex partners with wide sexual networks, the implications for HIV transmission are clear.

1.2 Preferences

Preferences regarding commercial sex vary across cultures. In some cultures fidelity is highly valued, while in others the procurement of commercial sex is an acceptable outlet for males. For example, in most countries in Asia, it is 'culturally acceptable for men to visit sex establishments and to have many sexual partners, whereas women are culturally required to remain faithful to their husbands' (Tan and Brown 1994). In Africa, male chastity is 'usually regarded as unnatural or even unhealthy' while there is 'no great condemnation of transactional sex by women outside of marriage' (Caldwell et al 1993). In the Pacific, cultural values of premarital chastity and postmarital fidelity for women persist in many places, contrasting sharply with a tacit license for sexual promiscuity granted to Pacific men (Brewis 1992).

These differences in customs or preferences are consistent with the great difference between males and females who are virgins at first marriage in Asia and the much smaller differences in the African countries, shown in table 1, and in the percentages reporting one or more non-regular partners in table 2. The much higher percentages of women in African countries reporting premarital and extramarital sex than in Asian countries are consistent with the lower social regulation of female sexuality in Africa. The more equal, though still unequal, sexual freedom of men and women in Africa and South

Table 1. Percentage of ever-married men and women who are sexually experienced at time of first marriage or partnership

		Age	
Location	**Sex**	**25–29**	**30–34**
Côte d'Ivoire	M	65	76
	F	48	44
Kenya	M	85	92
	F	69	75
Tanzania	M	70	76
	F	24	23
Lusaka, Zambia	M	62	74
	F	49	44
Manila, the Philippines	M	64	71
	F	17	12
Singapore	M	43	29
	F	8	5
Thailand	M	32	74
	F	2	4
Rio de Janeiro, Brazil	M	83	86
	F	29	21

Source: Caraël et al 1994, p. 159.

Table 2. Percentages of men and women aged 15–49 reporting one or more non-regular sexual partners in the last 12 months, by current marital status

	Men		
Location	Currently married	Formerly married	Never married
Central African Republic	14	12	14
Côte d'Ivoire	49	61	54
Guinea Bissau	42	49	49
Togo	21	8	17
Burundi	8	6	6
Kenya	21	75	44
Lesotho	46	55	36
Tanzania	21	64	49
Lusaka, Zambia	35	46	35
Manila, the Philippines	8	20	23
Singapore	6	40	13
Sri Lanka	5	11	3
Thailand	17	59	45
Rio de Janeiro, Brazil	31	91	69

	Women		
Location	Currently married	Formerly married	Never married
Central African Republic	4	11	4
Côte d'Ivoire	10	38	29
Guinea Bissau	19	7	28
Togo	2	0	1
Burundi	3	0	0
Kenya	3	35	32
Lesotho	19	21	14
Tanzania	7	43	28
Lusaka, Zambia	10	15	8
Manila, the Philippines	1	5	1
Singapore	0	8	0
Sri Lanka	3	18	1
Thailand	1	14	1
Rio de Janeiro, Brazil	5	34	17

Source: Caraël et al 1994, p. 161.

America than in Asia suggests that commercial sex will be relatively less important (and noncommercial non-regular sex more common) in the former regions and commercial sex more important in Asia.

1.3 Substitutes for and complements to commercial sex

There are several substitutes for commercial sex. These include marital sex and noncommercial non-regular sex. As mentioned above, such traditions as bride-price and polygyny delay marriage for many men and so they turn to commercial sex as a substitute for marital sex. What these traditions are doing in an economic sense is increasing the price of marital sex and leading to the substitution of commercial and other forms of non-regular sex for marital sex. In those countries and societies where pre- or extramarital sex for women is not sanctioned, for instance in Asia, the price of noncommercial non-regular sex ('casual sex') is high and commercial sex is most likely to be substituted for marital sex. In countries where women have more sexual freedom, noncommercial sex may be the closest substitute, followed by commercial sex (since its price is higher).

Commercial sex is not a homogeneous service. There are different 'qualities' of commercial sex signalled by differences in nominal price that are often reflected in the location in which the sex take place. Presumably, the higher the social status of the establishment, the higher its price (reflecting, in part, the beauty and education level of its sex workers), the lower the rate of HIV infection, the more knowledgeable the clients of HIV risk, and, perhaps, the more likely are condoms to be used. As noted above, as the risk of infection from commercial sex increases (and therefore the full price of commercial sex increases), we would expect to see a substitution away from the consumption of commercial sex. While this may be true, it is also possible that the adjustment occurs not on quantity of commercial sex, but on its quality.

If perceived risk has risen, customers may shift away from riskier forms of commercial sex to less risky forms or from commercial sex to noncommercial non-regular sex, which may be perceived to be less risky. A lower full price of commercial sex may result from commercial sex with a higher nominal price (but lower real price because the risk of infection is lower) or with 'new types' of sex workers with lower perceived risk. The 'newer' sex workers are often children and women from neighbouring countries.

In Thailand, since information on the incidence of HIV among sex workers has become more widely available, there has been increasing recruitment of women from the rural hill areas of Thailand, Myanmar, and Vietnam into the sex industry. These women are perceived as 'cleaner' and 'safer' than ethnic Thais (Celentano et al 1994). This perception appears to be based in fact since Celentano et al (1994) found sex workers from hill tribes and Myanmar to have lower rates of HIV infection than ethnic Thai sex workers. This difference is likely to be transitory, as they also found the rate of HIV infection to rise with time as a sex worker. So substitution among different types of sex workers is likely to have, at best, a short-run slowing on the rate of HIV spread in Thailand. It will increase the rates of infection in the home country of the sex workers since they are likely to visit home and possibly return permanently. Much the same phenomenon has been observed in Indian brothels, which house large numbers of Nepali women and girls (Human Rights Watch 1995). These women are prized for their fair complexions and youth, and young girls are seen as disease-free.

1.4 Consumer incomes

It is not clear whether commercial sex is a normal good or an inferior good, that is, whether its demand rises or falls, respectively, when income rises. If other sexual outlets are denied men of low income, commercial sex may be an inferior good. Commercial sex may lack the emotional and interpersonal elements of most noncommercial sex and in this sense is probably less preferred, all else constant, by many men. Evidence noted elsewhere in this paper, namely that bride-price, polygyny, and other customs increase the price of brides and reduce access to a wife, suggests that marital sex may be a normal good and commercial sex an inferior good. As the income of men rises, they demand a wife or wives. However, because wives produce children and provide labour services as well as sexual services, it is not clear that it is some other aspect of a wife that is a normal good rather than her sexual services. Supporting evidence is shown in table 2: married men consume less non-regular sex than do non-married men. But this may reflect the lower price of marital sex rather than an income effect. Since married men do consume commercial sex (Caraël et al 1994), commercial sex may be a normal good. Thus, as incomes rise, demand for commercial sex will also rise.

As Philipson and Posner (1995) have observed, 'In a society in which women are very poor, prosperous men have ready access to multiple sexual partners because the "price" of women's sexual services, both in the prostitution market and in less explicit sex markets is very low'. Although we did not find studies that looked at income elasticities of demand for commercial sex, one study in Thailand (Morris et al 1995) did find that customers with higher permanent income (as measured by number of possessions) did demand safer sex (were more likely to use a condom). This finding likely reflects both taste (or knowledge) differences and income differences between men.

1.5 Prices

The demand for sex should be inversely related to its price. We are not aware of any studies that have investigated the sensitivity of the demand for commercial sex to changes in nominal prices. However, some information on price effects can be gleaned from the impact of condom prices on use, the impact of the AIDS epidemic on the demand for sex, and the impact of periodic government crackdowns on the industry.

Commercial sex carries considerable risk of infection with HIV or another STD. This means that its true price is often higher than its nominal price and that the wage sex workers receive is often below what it would be if they were fully aware of the risk. It also means that there is a demand for a complement to sex: condoms. In general, of course, the more expensive condoms are the less likely they are to be used. It has been noted that the price of a condom is very low relative to the price of commercial sex. This, however, is not true in the case of low-priced sex work, which is the bulk of the market. For the customer, a condom can increase the cost of sex by 10 per cent to 20 per cent or more, if available. As mentioned elsewhere in this paper, for a low-end sex worker, the price of a condom can be equal to 25 per cent of her profit. As a result, reductions in the price of condoms are likely to have a greater impact on the supply of safe sex in lower-income countries and among lower-income groups within countries. As a share of the costs incurred in noncommercial sex, condom price looms even larger.

Philipson and Posner (1995) showed that as the cost of condoms fell in Ghana and Zimbabwe, sales of them rose. In a cross-national regression they found that the cost of condoms (the amount of work needed to purchase condoms) is inversely related to the percentage of the urban population that is HIV-positive. Thus, reductions in the price of condoms increase use and decrease the incidence of HIV. Experience in Thailand with the 100 per cent condom programme (discussed below) also supports this assertion.

Because the full price of commercial sex includes the risk of contracting an HIV infection, the incidence of HIV/AIDS itself should affect the demand for commercial sex. If it is known that sex workers are highly vulnerable to HIV infection, then the real price of commercial sex is higher than in the absence of HIV/AIDS. Thus one would expect to see the amount of commercial sex decrease as information about AIDS spreads. For example, Jones, Sulistyaningsih, and Hull (1994) relate that when it became known that two sex workers in a compound were HIV-positive business declined by 50 per cent. However, other outcomes are possible: the substitution of safer sex for unsafe sex and responses on the supply side of the market. Philipson and Posner (1995) note that data from developing countries to test the proposition that safer sex is substituted for less safe sex is lacking but offer anecdotal evidence: in Africa the price premium for very young sex workers, who are perceived to be less likely to be infected, has risen.

Caldwell et al (1993) also note that in Africa older men are demanding younger women in the hope that they are less likely to be HIV-positive. Brown and Sittitrai (1995) report a similar impact in Thailand, where the supply of child prostitutes has risen with the price premium, and the number of young girls working in Indian brothels also appears to be rising (Human Rights Watch 1995). In a study of US youth in the 1980s, Ahituv, Hotz, and Philipson (1996) found that condom use corresponded with the expectations of economic theory. In 1984, use rates by state were equal. By 1990, use rates were higher in states with higher seroprevalence. Condom use rates also rose most for the group thought to be at highest risk: sexually active young men. The implication of this substitution away from unprotected sex as its real price rose with the increase in seroprevalence is that the rate of spread of HIV will be lower than that predicted by purely epidemiologically based models.

Despite the risks associated with unprotected sex, the dislike that some men have for using condoms may result in them paying more for sex without a condom. They can do so by searching out more expensive child prostitutes who are perceived to be lower risk, as just discussed, or they may pay sex workers more to have unprotected sex. Although there is plenty of anecdotal information on this, there is little empirical data. Work in progress in Mozambique by Dr. Amelia Cunhu found that commercial sex workers in the market area of Maputo charge 15,000–20,000 meticais for sex with a condom and 25,000–30,000 meticais for sex without a condom. Those in a residential area near a hotel charged 75,000 for sex with a condom and 150,000 for sex without a condom (A. Cunhu, personal communication).

The impact of the seroprevalence rate on the adoption of safer sex practices may be more complicated than is generally thought. It may be nonlinear. The benefits of safe sex are positively related to the probability of one's partner being infected but negatively related to the probability that one is infected. In the absence of widespread testing services, the average expected benefit of safer sex can decline, depending upon the rate of infection in the population and, for sex workers, the longer the individual has been a sex worker. As Philipson and Posner (1995) point out, if sex workers have few incentives to user safer sex practices, then the burden of protection falls on customers. However, by a similar argument, if customers think they are infected, the benefits to them of safer sex are small or zero. Thus, it seems that the threat of contracting HIV will cause the adoption of safer sex practices as long as the current level of risk is not too high.

For example, in a survey of low-price sex workers, truck drivers, and low-income males in Thailand, Morris et al (1995) found that respondents' perceptions of their risk were inversely related to condom use. In another study in Thailand, Celentano et al (1994) found rates of HIV infection among sex workers between 40 per cent and 65 per cent. They also found that although 61 per cent of sex workers reported using condoms with all customers during the previous month, inconsistent use was most prevalent among those who were more likely to be HIV-positive. In addition, lacking alternative forms of employment, sex workers may respond to the increased real price of sex by decreasing the nominal price rather than by ceasing to work as a sex worker. Thus, the amount of sex traded may not decrease.

Evidence from Thailand and Kenya suggests that responses to HIV/AIDS have in fact decreased the quantity of commercial sex and the degree of risk in commercial sex. In Thailand a national policy intervention was carried out, while in Kenya some pilot projects were mounted. After the potential growth of the AIDS epidemic and its main source were identified, there was a massive increase in the supply of condoms in Thailand. In 1991, the centrality of condom use, especially in commercial sex, was codified in the 100 per cent condom programme: 100 per cent use of condoms 100 per cent of the time. Condoms were to be used in all commercial sex establishments all of the time. National law enforcement authorities were used to enforce the provisions of the programme with sanctions and tough fines on brothel owners. Because of the extensive public health surveillance and prevention network already in place, it was possible to identify which brothels were complying and which were not through commercial sex workers reporting for regular checkups at government clinics. The sex workers were also offered free, unlimited supplies of condoms. This lowered the price of safer sex for them.

According to Hanenberg and Rojanapithayakorn (1996), since 1989 the number of sex workers decreased by 25 per cent, men patronise commercial sex workers less, and women are less willing to engage in commercial sex, especially based in brothels. Commercial sex has become more expensive, perhaps because of the cost to brothel owners of complying with the 100 per cent condom policy, or because sex workers, at least in brothels, have become aware of the true risk of their work and have demanded higher wages (assuming that they or their agents have adequate bargaining power). Before the programme, 15 per cent of commercial sex workers always used condoms; by 1994, 90 per cent did (although there are differences in use by type of establishment, region, and type of commercial sexual relationship, as noted elsewhere in this paper). In addition, in 1993 the percentage of army conscripts, the most sensitive indicator of HIV transmission in Thailand, began to fall. Between 1989 and 1994 the number of men coming to government clinics for STD treatment declined by more than 90 per cent (Hanenberg and Rojanapithayakorn 1996).

However, offsetting these changes, commercial sex has also shifted to less direct forms, that is, those not associated with brothels (restaurants, tea houses, cafes, hotels, the street). This later development, predictable as a form of substitution caused by the increase in the price of brothel-based commercial sex, can reduce the impact of the 100 per cent condom programme because indirect commercial sex is more difficult to regulate, its sex workers have less bargaining power to negotiate condom use, and it attracts customers who will not use condoms, a particularly high-risk group of customers.

The success of the campaign is credited to its narrow focus: substantially increasing condom use in commercial sex rather than attempting to eliminate commercial sex or to change public morality. The 100 per cent condom programme had several, possibly offsetting, effects that resulted in the decline of brothel-based commercial sex: the insistence that customers use condoms increased the effective price of sex (since customers do not like condoms), thus decreasing demand. This may be offset by a perceived decrease in risk of brothel-based sex, which would decrease its real price, and increase rather than decrease demand. Since brothel owners (as the controllers of the supply of brothel-based sex) faced higher costs of doing business, the supply of commercial sex (at any particular price) would be lower. The evidence reported above suggests either a reduction in supply of, or demand for, brothel-based sex, or both, occurred. Some sex workers were probably displaced into the indirect sex industry, where they may be at greater risk.

According to Hanenberg and Rojanapithayakorn, STD treatment played a minor role in the campaign. Based on findings from recent studies in Africa, treatment of STDs could have further reduced HIV transmission, especially from commercial sex customers to their spouses and other partners.

Although the impact of the 100 per cent condom programme in Thailand appears to be considerable, it is not clear whether the programme was solely responsible for the rise in condom use and decline in sex work. While the programme was being implemented there was a concerted mass media campaign about seroprevalence among sex workers and the availability of condoms. This is not to deny that the programme played a role or that it contains some policy lessons that may be useful for other countries.

Most countries in Africa have in place control programmes for HIV/AIDS, but so far, there have not been significant changes in risk behaviours. Exceptions have been programmes that have focused on high-risk groups. One such programme in the Pumwani area of Nairobi focused on a group of female sex workers and provided education in safer sex negotiations, STD/AIDS education, condom promotion, and STD/AIDS counselling. Condom use increased from 0 to 80 per cent, STDs decreased, and there has been a threefold decrease in sex workers' susceptibility to HIV infection and thus reduced transmission to customers and their other females partners (Ngugi et al 1996). The estimated cost per case of HIV infection thus prevented is approximately US$8–US$12 (Moses et al 1991). The study also noted an increase in price and a decrease in demand for commercial sex. No explanation for these changes is given but it could be that as sex workers become more aware of the true price of sex work they decrease supply. Similar programmes have been established in other sites in Kenya and in Bulawayo, Zimbabwe, with similar results.

It must be emphasised that such interventions are very small given the size of the sex industry in Africa. Ngugi et al (1996) reported that in 1991, such programmes involved about 24,000 sex workers. In just one city in Zimbabwe they estimated there were 12,000 sex workers. They suggest that the lack of expansion of these programmes is due to inadequate political commitment; deficiencies in planning, management, and human resources; and insufficient funding. Almost all funding for these programmes has come from external donors.

It appears that focused interventions with sex workers in Indonesia would yield similar results. The sex workers in the Bali study have high levels of contact with health care providers (although with private providers rather than government clinics), only 16 per cent of them responded that they do not 'like to use condoms', and only 16 per cent reported having ever lost a client by requesting the use of a condom (Wirawan, Fajans, and Ford 1993). However, as Wirawan et al point out, programmes also need to include customers, since they are the ones that most often decide if a condom will be used, and, for lower-priced sex workers, pimps and brothel owners because they often control the supply of condoms and influence the decision on their use.

Section Two: The supply of commercial sex

Before discussing the factors that influence the supply of sex workers we will give a brief profile of the characteristics of sex workers in a number of countries. These profiles suggest several factors that influence the supply of sex workers and clearly illustrate the high levels of risk in commercial sex. The intent here is to discover more about the characteristics of sex workers, not to draw a single profile of the representative sex worker. The studies discussed have different sampling methods, from snowball techniques to random sampling, and different sample sizes, from 42 (Pickering and Wilkins 1993) to more than 1,000 (Potterat et al 1990).

2.1 A profile of sex workers

Most sex workers are young. In Calcutta, 85 per cent were younger than 30 years and 25 per cent younger than 20 years. Nine per cent had been sex workers for less than a year and 65 per cent for less than five years. Fully 84 per cent were illiterate and the remainder had only primary school education. About 60 per cent had three or four clients per day and 14 per cent had five or more (Chakraborty et al 1994). In a study of sex workers in Addis Ababa, 59 per cent were illiterate (Mehret et al 1990).

In Chaing Mai, Thailand, only 32 per cent of low-class commercial sex workers had more than primary school education and only 16 per cent had worked as sex workers for more than five years. Their average number of clients per day was 4.3 (range 1–16, Celentano et al 1994). In low-priced brothels in three urban areas in Thailand, including Bangkok, 40 per cent of sex workers were under age 18 (and, therefore, child prostitutes), 20 per cent of the women had less than four years of education, and few had more than the compulsory six years. Years of experience as sex workers differed by region of origin. Of the women from the North, 14 per cent had been sex workers for less than a year and 32 per cent for more than three years. In contrast, 31 per cent of women from the Northeast had been working in the sex industry for less than a year and 19 per cent for more than three years (Wawer et al 1996).

Brown and Sittitrai (1995) cite ethnographic studies by the Thai Red Cross of two villages in the North. In these two villages, 46 per cent and 71 per cent of female sex workers entered the industry before age 18. Those from the North entered the industry through the well-established recruitment networks where agents tempt the family with wealth or help the family out during an economic crisis. The agent then demands the repayment of the debt and recruits a daughter from the family into sex work (Brown and Sittitrai 1995).

Those from the Northeast entered because of a broader set of reasons, including marital disruption and family strife. It is clear that at least some women who are sold into the sex trade are unaware of their fate. Brown and Sittitrai (1995) chronicle patterns of deception where a woman is promised work in construction or a factory but is coerced into sex work.

In the South Pacific, commercial sex is a long-established and growing industry (MacFarlane 1983; Plange 1990; Jenkins 1994). In Fiji, estimates suggest that the number of sex workers per capita is similar to that in Thailand (Ahlburg and Larson 1995). Jenkins (1994) also found that sex work is common in Papua New Guinea, where girls as young as 12 are employed as sex workers and where 13 per cent of the sex workers in her sample were younger than 20 years of age. Jenkins estimated that the lowest-paid sex workers had between 300 and 900 customers per year. Higher-paid sex workers had fewer customers and 'part-time' workers had around 50 partners per year. Condom use is very low, around 5 per cent. Such low levels of condom use are common throughout the Pacific (Ahlburg and Larson 1995).

In Bali, Indonesia, where there is a well-established sex industry, a study by Wirawan et al (1993) found a three-tiered price structure to the market. High-priced sex workers have much higher levels of education (10 years), fewer clients (mean 1.4 per day, range 1–3), and charge more (US$75 for a short time, US$125 for all night). Low-priced sex workers who operate in brothel complexes with 50 to 500 sex workers, have low levels of education (6 years), low prices (US$2.50 for a short time and US$12.50 for all night), and many more customers (mean 4.6 per day, range 1–8). The mid-price sex workers charge about three times as much as the low-priced sex workers and have only slightly more customers per day than high-priced workers. The low end of the market sells to locals, the mid-level to locals and Indonesian and foreign tourists (who are charged three times as much as locals), and the top end to wealthy Indonesians and foreigners.

The risk characteristics of the different levels of workers differ radically. Low-priced sex workers had much less knowledge of HIV/AIDS than the other groups, were much less likely to perceive themselves as being at risk, and were much less likely to use condoms. Cost could have been a factor in the low use of condoms. The price of a single condom was equal to about 25 per cent of the profit per customer of a low-priced sex worker (Wirawan, Fajans, and Ford 1993). Consistent supply and quality are also contributing factors. The price of condoms also reduces their use in many other countries, particularly among the poor. For example, it would take a low-paid female garment worker in Fiji almost two hours to earn the cost of a packet of three condoms (Ahlburg, Larson, and Brown, forthcoming).

The length of a sex worker's career may be relatively short. However, the data on which this assertion is based is quite limited. Information from 19th-century Europe suggests that 25 per cent of women quit within a year and only about half remained after five years (Potterat et al 1990). Wirawan, Fajans, and Ford (1993) observed that most sex workers 'work for only several years, earning a "nest egg" consisting of land and a house located in their home village'. No evidence is given to support this observation. In Colorado Springs, USA, Potterat et al (1990) reported that 75 per cent of sex workers were less than 25 years of age and that average career longevity was five years. However, because sex workers are so mobile and because all samples were censored, estimates of length of career in sex work are biased down by an unknown amount.

In sum, sex workers tend to be young, have relatively low levels of education, and tend to come disproportionately from certain geographic areas. In many places, there tends to be a division of the market by quality. The top end of the market is characterised by higher nominal prices, lower volume, and lower-risk. The bottom end has lower nominal prices, high volume, and higher risk. Entry into sex work seems to be voluntary in some instances but in others coercion plays a role. Data on the length of a sex worker's career are inadequate but there does seem to be considerable turnover in the profession.

2.2 Number of suppliers

Why would a person choose to become a sex worker? According to the economic model of occupational choice, such an individual makes that choice because sex work maximises their utility by paying more and/or because they 'like' sex work. Note again, that we assume a free choice is being made and that this choice is among a set of possible occupations. If free choice does not exist, then some individuals may become sex workers because of compulsion or threat of physical violence. Examples of this are women forced into sex work by occupying forces in the Second World War, women kidnapped during civil unrest today, and children sold into sex slavery. If sex work is the only occupation available then no matter what the individual's preferences, they must choose sex work to survive. In addition, models of occupational choice assume the ability to move to an area where a higher-paying or preferred job exists. If such mobility is not possible, then occupational choice occurs from a reduced set of options. Sex work may be the best or only option available in the current location. It may not have been chosen if the individual could move freely.

What factors lead to an individual being able to choose among occupations and what factors determine the pay to these occupations? Human capital (education, training, and health) affects occupational choice and wages. Individuals with more education and training and better health have greater choice and earn more. One reason why sex workers tend to be female is that they often have less human capital than men. Their job options are fewer and their earnings are less. Because they are the ones to bear and raise children, women will choose jobs that are compatible with childrearing – unskilled jobs – or jobs that require little human capital. Thus women seek employment where intermittent labour market activity is not penalised, or in which skills do not deteriorate during periods of nonemployment, or in which there is relatively little general or specific training. Examples of such work are simple agricultural work, informal sector work, and sex work. This was the case in Europe and the United States in the 19th century, where lack of education and limited job opportunities left unsupported women with little alternative but to sell sexual services to survive (Finnegan 1979; Walkowitz 1980; Hardy 1987; Corbin 1990). It is the case in developing countries today.

These choices are further limited by explicit discrimination against women in labour markets. Evidence of sex discrimination in labour markets in a number of developing countries exists, although such discrimination is by no means universal (Birdsall and Sabot 1991). In most, if not all countries, the major determinant of the difference between the employment and earnings of women and men is the greater human capital, especially education, possessed by men. This has an important policy implication. Antidiscrimination policies aimed at the labour market may not have a very large impact in some countries. What needs to change is the allocation of resources within the household that favours males over females. These early investment decisions in the family bias the occupational choices of some females, particularly those from poor households, toward sex work. For example, in Papua New Guinea, the male literacy rate is twice that of females and the gap has widened over the last decade and a half (UNDP 1994). The incidence of sex work in Papua New Guinea has risen as the education gap has increased and the potential for a serious AIDS epidemic has emerged (UNDP 1996).

Poverty, which has increased in Africa and India (World Bank 1990), has long been seen as driving individuals into sex work. In Africa, it has been reported that poverty has not only expanded the number of women working as 'full-time' commercial sex workers but has also caused a wide range of females, including office workers and schoolgirls, to enter sex work (Akuffo 1987). In a random sample of 450 sex workers in Calcutta, 49 per cent reported being forced to enter sex work because of extreme poverty and 22 per cent because of 'family disturbances' (Chakraborty et al 1994). Basu (1995) reported that most commercial sex workers 'are motivated by their extreme poverty, their economic responsibility for their parental families, and their lack of access to other forms of employment'.

Studies of sex work in Fiji (Plange 1990) and Papua New Guinea (Sinclair 1992; Jenkins 1994) cite economic factors as the key determinant of sex work. Plange (1990) describes economic need occasioned by unemployment, divorce, desertion, inadequate government help, failure of husbands to pay maintenance, and the breakdown of the extended family as factors explaining sex work. In Port Moresby, Papua New Guinea, Sinclair found that women and men have turned to sex work as one of the options to make a living in a city with very limited employment opportunities. She found female sex workers to be poorly educated, with families and relatives to support, and unable to find any formal employment.

The lack of opportunities are particularly pressing for the young. This, as well as customer preferences, may explain the concentration of sex workers who are young. In Papua New Guinea, Jenkins (1994) reports that young women between the ages of 14 and 18 sell sex to pay for school fees, to buy clothes, and to travel. Among the poorest families, very young girls between the ages of 10 and 14 are offered to any paying customer. While it is not known how prevalent these practices are, the increasing need for schoolchildren to fund their education, combined with increasing demand for sex with younger individuals by older men, puts schoolchildren at greater risk and emphasises the need for policies to protect them from sexual harassment, particularly by teachers and other school personnel.

Child sex workers

The plight of children involved in the sex industry demands particular attention. At least in Thailand, child sex workers have long been part of the sex industry, catering largely to local demand. It is estimated that there are between 30,000 and 40,000 child prostitutes (age less than 18 years) in Thailand and that they work largely in the commercial sex industry (Brown and Sittitrai 1995). For a number of reasons, child sex workers are at higher risk of contracting HIV than are older sex workers. Some of these factors are biological while others are a function of their weaker bargaining position vis-à-vis the client. Part of the reason for the growing demand for child sex workers is that they are perceived as 'cleaner' and therefore a condom is unnecessary. In addition, in the industry, virgins bring an especially high price. Focus groups in Thailand identified older men as the main demanders of child sex. It was said that older men believe that having sex with a child strengthens them, 'that it is like a vitamin'. Children are more expensive and it is older men who have higher incomes (Brown and Sittitrai 1995).

While some children enter the sex industry from a sense of family obligation or a desire to improve their economic position, Brown and Sittitrai (1995) found that a large number are forced into sex work. This is especially the case for children who are sold into sex work by their parents. They report instances where children have attempted to escape but have been captured by corrupt police and returned to brothel owners. It is not clear how widespread such instances are but the illegal nature of the business and the profits generated by child prostitutes foster corruption.

Migration and commercial sex

At least in Asia, commercial sex workers in cities and towns have come from somewhere else. Wirawan, Fajans, and Ford (1993) found that less than 10 per cent of commercial sex workers on Bali actually were from Bali. Migration from north and northeast regions of Thailand, as well as Myanmar, is sufficiently important that Archavantikul and Guest (1994) term migration the key link in the expansion of prostitution. Only 2 per cent of the population of Taiwan is aboriginal, yet 40 per cent of the population of commercial sex workers in Taiwan are aboriginal, having migrated from rural areas (McCaghy and Hou 1993). As many as half of the brothel workers in Bombay may be Nepali (Human Rights Watch 1995).

Remittances, either monthly or in the form of savings brought back to the home village on leaving the commercial sex industry, are an important part of the migration story. For Thailand, Archavantikul and Guest (1994) estimated that the average massage parlour worker saves or remits 50 per cent of her income. Remittances from these women averaged more than 6,000 baht per month, and even relatively low-paid brothel workers averaged remittances of more than 1,800 baht per month. Compared to annual per capita incomes in the sending north and northeast regions of Thailand of 24,000 and 15,000 baht, these remittances are very large. Wirawan, Fajans, and Ford (1993) found that most Balinese commercial sex workers were saving to earn a nest egg for returning to their home villages. Jones, Sulistyaningsih, and Hull (1994) confirm that Indonesian commercial sex workers who have migrated to cities and towns maintain strong links to their villages, often returning there during their menstrual periods, and on leaving the commercial sex industry, return to live in (typically high-quality) houses built with commercial sex earnings.

Jones, Sulistyaningsih, and Hull (1994) describe two other important features of migration to enter the commercial sex sector. The first is that, in Indonesia, there are fairly small geographic regions that have had, apparently for centuries, the reputation of being sending areas for concubines, initially, and commercial sex workers today. Migration networks are important in other settings as well. Girls from certain ethnic Tamang villages in Nepal tend to go to the same areas of India (Human Rights Watch 1995). Portuguese women migrate to Spain to become commercial sex workers (Geis 1993). Archavantikul and Guest (1994) found that girls and women from particular Thai villages tended to go to the same place. One village might send people to Japan, and another to Bangkok.

The second key feature that emerges is that the decision to migrate often is not the decision of the individual. Rather, the decision to migrate and to enter commercial sex work is taken by the parents or another family member, sometimes in conjunction with the woman, and sometimes not. Thai daughters are clearly responsible for their parents' support, for example, and seem to choose commercial sex work as a way of meeting family needs. Remittances flow from the daughter and are important in Thailand, Indonesia, Taiwan, and other Southeast Asian countries. In other societies, for example in South Asia, the family support aspect of the daughter's entry into commercial sex work persists, but is satisfied by a one-time payment from a broker or madam to the parents or other relatives. The entry of the daughter into commercial sex work is much less a reflection of her individual choice and much more one of some sort of collective decision by the family. In many instances, the contract is one of indentured servitude, often under terms of repayment that are impossible for the woman to satisfy.

The supply side issues associated with commercial sex are much like the choices modelled by the 'new' migration theory (Stark and Bloom 1985; Stark 1991; Massey et al 1993). The central tenets of this approach are that migration is a function of the relative deprivation of sending families, and that the decisions resulting in a family member's migration reflect the portfolio decisions of the larger unit, rather than purely individual characteristics. Massey et al (1993) summarise the policy prescriptions that flow from the model:

- Families, especially rural families, have few ways to spread risks. Migration of a family member, into commercial sex or into other work, is one way of reducing risk faced by the family, and therefore it does not necessarily depend on the existence of large wage differentials.
- Families may use the remittances (or in the case of South Asia, the sale proceeds) from a daughter in commercial sex work to acquire capital. Indeed, the evidence that commercial sex worker remittances are used to buy physical capital for farming in Thailand (Archavantikul and Guest 1994) or for expenditures by commercial sex workers on housing in their home village (Jones, Sulistyaningsih, and Hull 1994) is convincing on this score. Therefore, poverty alleviation in the sending region may *not* slow the rate of sending. With poverty alleviation comes increasing returns to investment and, therefore, increasing pressure for the investment funds that commercial sex work can provide.

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- Relative deprivation as the driving force in migration means that policies that affect the poorest households will have the biggest impact on migration.

Taken together, these implications of the migration model provide reason to be pessimistic regarding possible supply side interventions in sending regions. Relative poverty is persistent, almost by definition. The lack of risk-spreading institutions and well-developed capital markets is difficult to remedy.

2.3 Earnings from sex work

High earnings in sex work are a major factor influencing the supply of sex workers. Several studies have shown that sex work offers earnings far greater than those that could be earned in occupations requiring similar (or even greater) levels of education. For example, Pickering and Wilkins (1993) found that sex workers make three times more per day than women engaged in informal sector activities. In fact, sex workers earned as much as senior civil servants. Their study of sex work in The Gambia found choice of occupation to be made freely, although from a set of choices that was constrained by levels of education. In colonial Nairobi, women reportedly saw prostitution as a reliable means of capital accumulation, not as 'a despicable fate or a temporary strategy. The work of a prostitute was family labour' (White 1990).

In Bali, Indonesia, average weekly earnings of low-priced sex workers were about US$90 (range US$18–US$280), considerably higher than the monthly income of the average civil servant. Mid-priced sex workers have weekly earnings about twice those of low-priced workers and top-end sex workers earn US$400 per week (range US$45–US$1,400). In Thailand, Archavantikul and Guest (1994) estimated the average wage of massage parlour workers to be 35,000 baht (US$1,400); while average earnings for women in other industries were 1,500 baht. The massage parlour workers remitted on average 6,151 baht per month, which was 25 per cent of per capita income in the North and 40 per cent in the Northeast. Lower-earning brothel workers remitted 1,841 baht per month.

The impact of remittances sent by the sex worker on the economic position of the family of origin is striking. In the Arhavantikul and Guest study, the families of sex workers had the lowest income (excluding remittances) but the most expensive houses and the greatest number of consumer goods, including vehicles. In the Red Cross ethnographic studies, 10 per cent of women reported that they were very poor before entering sex work while 44 per cent were poor, 11 per cent moderate, and none rich. After having worked in sex work, none described their economic status as very poor, 7 per cent were poor, 37 per cent were moderate, and 21 per cent were rich (Brown and Sittitrai 1995). Such earnings differentials are promoting sex migration in several parts of Asia. For instance, young women from Myanmar and the Shan tribes migrate into southern Thailand, Nepalese girls into India, and Vietnamese sex workers into Cambodia (Brown and Sittitrai 1995).

In Fiji, Plange (1990) estimated that the average high, medium, and low weekly earnings for sex workers was F$300, F$160, and F$100. Women who were employed in the garment industry made approximately F$40 per week. Jenkins (1994) estimated average cash earnings for sex workers in Papua New Guinea of 100 kina plus in-kind earnings of beer, transport, and other commodities. The cash earnings alone were about twice the earnings of unskilled female urban employees and about the same as semiskilled employees.

The high earnings from sex work attract women into the market on a part-time as well as a full-time basis. In the United States, Potterat et al (1990) showed that only about one-third of the prostitutes they tracked through public health and police records in Colorado Springs were full-time, long-term prostitutes. Of those women who occasionally engaged in commercial sex work, most did so only in time periods where the activity was particularly lucrative, such as immediately following military pay days. In Benin City, Nigeria, Omorodion (1993) found that female long-distance traders augment their low earnings by sex work. Two-thirds of the women were married, but for 44 per cent of them their main sexual partner was a boyfriend, and for 26 per cent, a stranger. About 20 per cent of the women have three or more regular partners. For 65 per cent of the women the motivation for their extramarital relationship was economic. As economic conditions have worsened in

Nigeria, more and more women have become market traders in order to increase family income.

Because of the relatively high earnings of sex workers in many countries and the low levels of education, backgrounds of poverty, and often disrupted marital relations, it is highly unlikely that current sex workers would be willing or able to leave sex work and enter alternative and much lower-paying occupations. For these women and men, interventions to reduce the risk of their work are most likely to have an impact on the transmission of HIV/AIDS. Policies that improve educational levels, particularly of women, and reduce poverty may reduce the number of women who work 'part-time' in sex work and may decrease the entry of new workers into the industry.

Section Three: Safe commercial sex

3.1 Power, sexual exchange, and HIV risk

The analysis of commercial sex above assumes that there is a free exchange in the market for sex: those who demand sex do so in a free and informed way and those that supply sex do so freely and with the necessary information about the market. There are survey data that suggest that there is an asymmetry in the market for sex. This asymmetry is present in regular sexual relations as well as in noncommercial and commercial sexual relations. A survey of women at high risk in Ghana (sex workers, long-distance itinerant traders, and the partners or wives of police, military, sailors, long-distance drivers, and HIV-positive men) found that although 62 per cent of women thought that a woman has the right to refuse sex with a promiscuous partner and 90 per cent think she has this right with a partner with an STD, only 36 per cent and 80 per cent of women, respectively, think that they, themselves, have such rights (Awusabo-Asare et al 1993). In fact, 16 per cent of the women had had sex with a partner knowing that he had an STD. The differences between general and specific beliefs were particularly large for women with no formal education or with only primary education.

In commercial sex establishments, sex workers generally do not have the right to refuse sex to a customer (Bloom and Mahal 1995). The brothel owner acts as their agent and decides if a customer is to be refused the services of the sex worker. A further problem is that insistence on condom use by a sex worker can be interpreted by the customer as a sign of disease and mistrust and will harm the reputation of the sex worker and reduce her earnings. Condom use may become a signal. As Morris et al (1995) observed, 'Use in effect says "yes, I am unclean, I am diseased." Non-use, by contrast, becomes a symbol of cleanliness'. If condoms are taken to signal disease, campaigns to increase condom use may have adverse effects. Because of the necessity to earn a living sex workers will not use condoms so as to signal their disease-free status. They may even charge higher prices to bolster their claim.

A similar adverse consequence of a policy was noted by Tan and Brown (1994): when mandatory HIV testing of sex workers was instituted in Thailand, a market for fake HIV-negative certificates was created. The need to signal disease-free status is particularly important for sex workers with regular customers. It is important for policy not to stigmatise sex workers for it may cause a reduction in condom use as sex workers try to signal that they are disease- free, independent of their true status. It may also reduce their willingness to seek HIV testing.

Power in sexual relationships is a function of the economics and custom. In East Africa and Southern Africa, where wives are farmers, they have almost no power in sexual relationships. In coastal West Africa, women refuse sex to diseased or drunken husbands because of their economic independence as traders, the ease with which they can break up their marriages and return to their family of origin, and the primary responsibility they have for insuring that sex does not take place during pregnancy or in the postpartum period (Caldwell et al 1993). Thus, the position of women in the society (economic and social) affects their power in exchange and thus their HIV risk.

It is often assumed that the agents to the exchange are fully informed about the exchange, particularly about price. In this analysis we have treated the risk of acquiring an STD, including HIV, as part of the price of sex. For the agents to be fully aware of the true price of sex there must be full disclosure of the health status of the partner. This is most unlikely in many if not most societies. In Ghana, Manuh et al (1991) noted that in most communities there is hardly any communication between partners on sex-related issues. In addition, in many societies sex occurs in the dark and with the participants at least partially clothed, making information on even those STDs that have obvious external manifestations difficult to acquire. Caldwell et al (1993) noted that in a number of African countries 'wives are not supposed to talk to husbands as if they assumed that they were engaged in extramarital relations, or imply this by demanding the use of condoms within marriage'.

3.2 Factors affecting the use of condoms in commercial sex

Consistent use of condoms in commercial sex can significantly reduce the risk of infection. However, there are substantial data that suggest that consistent use is relatively low. For example, in a study of sex workers in Calcutta, only 1 per cent used condoms regularly (Chakraborty et al 1994) and in Addis Ababa only 5 per cent did so (Mehret et al 1990). In Thailand, Morris et al (1995) found that consistent condom use with sex workers for men was between 25 per cent and 30 per cent. Among sex workers studied, 67 per cent of those in brothels use condoms consistently with all casual customers and only 55 per cent use them consistently with regular customers (Morris et al 1995). The most consistent predictor of use was the type of sexual relationship. For men, the adjusted odds of condom use were 75 per cent lower with a regularly patronised sex worker, and for female sex workers they were almost 80 per cent lower.

Morris et al interpreted the relational context to signal risk. Both sex worker and customer see regular relations as signalling trust and a personal bond of caring. This perception is not well placed because the sex worker has many other partners and 75 per cent of the regular customers of sex workers also reported sex with another sex worker in the last year. This false sense of safety in regular exchanges with sex workers is a difficult barrier to increasing condom use. Other factors that were found to influence the odds of condom use in multivariate results were: age, with the youngest and oldest women being least likely to use consistently; permanent income; and price. As one would expect from human capital theory, those who have more to lose from infection are more likely to use condoms. Customers with more assets were more likely to use condoms consistently as were sex workers who charge more per hour. Knowledge of HIV transmission did not significantly affect behaviour.

Use of condoms also varies by type of sex establishment and by region. For example, in Thailand Celentano et al (1994) found that consistent condom use was significantly higher in brothels than in indirect commercial establishments (70 per cent compared to 37 per cent) and higher in urban sex establishments than those in rural areas. Since HIV infection rates are higher in urban than in rural areas this latter finding is not surprising. Although sentinel surveillance data in Thailand suggest that rates of HIV infection in indirect commercial sex workers are lower than that in brothels, Celentano et al found high rates among some populations of indirect sex workers. Because of this, the lower condom use in indirect commercial sex establishments is troublesome. This is particularly true since condom use campaigns have tended to focus primarily on brothels and on urban areas. Substitution among different sex establishments within a type and also among types is relevant to the success of various policy initiatives. For example, in Thailand the 100 per cent condom policy won the support of brothel owners because the policy was going to be enforced equally rigorously across all brothels (Hanenberg and Rojanapithayakorn 1996).

Condom use in noncommercial non-regular sex is also not widespread, including noncommercial sex by sex workers. In a survey of non-regular sex in the Nigerian city of Calabar, known for its easy-going sexual morality, Ogbuagu and Charles (1993) found that although 53 per cent of men and 23 per cent of women participated in non-regular sex only 31 per cent of men and 24 per cent of women used condoms. Also, 16 per cent of men and 6 per cent of women currently had three or more sexual partners.

Alcohol, drugs, and commercial sex

Alcohol consumption may be viewed as a complement to commercial sex. That is, alcohol is a commodity that is often associated with the consumption of commercial sex (VanLandingham et al 1993). In East and Southern Africa, Caldwell et al (1993) state that although women migrate to towns less often than do their husbands and boyfriends, some women 'can find employment in towns in beer selling or commercial sex, both usually illegal, often interrelated, and usually dangerous'. In a study of sex workers in Calcutta, 81 per cent were found to consume alcohol regularly (Chakraborty et al 1994). In The Gambia, Pickering and Wilkins (1993) found that 55 per cent of prostitutes drank whereas only 8 per cent of widowed and divorced women and no married women did. They also found that although making and selling alcoholic beverages were potentially the most financially lucrative businesses available to women, only prostitutes or women who associated closely with them made or sold alcohol. Since it was not a socially acceptable occupation, it was not a viable employment option for most women.

Studies in Thailand have consistently shown that alcohol use increases the frequency with which men demand commercial sex and decreases the frequency with which they use condoms (Celentano et al 1993; VanLandingham et al 1993; Havenon, Knodel, and Bennett 1992). Morris et al (1995) found differences in the impact of alcohol on condom use depending upon the context of the sexual transaction. Alcohol use by the female sex worker lowers her use of condoms in the context of non-regular customers but with regular customers it is the customers' alcohol consumption that lowers condom use. This suggests to the researchers that sex workers control their exchanges with non-regular customers more closely, and therefore their own alcohol consumption is more important than that of their customers. With regular customers, the sex worker is more likely to allow the customer to influence the condom-use decision, thus the customer's alcohol use is more important.

A policy implication of the connection between alcohol and sex is that policies that increase the price of alcohol may also decrease the demand for commercial (and other forms of) sex and are also likely to result in more safe sex and less unprotected sex.

In developed countries there is often a close tie between drug addiction and commercial sex. This association arises either from the fact that many chemically dependent women began prostitution as a means of supporting their drug habit, or because they started abusing drugs to numb themselves from the realities of their work (Giobbe and Gibel 1994; Miller 1995). These arguments are identical to those put forward by writers on prostitution and alcohol use in Victorian England. Tait (1852, cited in Finnegan 1979) wrote that women who had 'first formed the habit of intemperance … subsequently resorted to a life of prostitution in order to procure the means of satiating their desires for stimulating liquors' and once prostituted drank to 'drown remorse and shame, and expel from their mind all uneasy feelings regarding their awful situation'. Drink and prostitution become what a Victorian pamphlet called a 'terrible reciprocity' (cited in Finnegan 1979, p. 145). That terrible reciprocity is still with us. With the rise of use of crack cocaine, more women are engaging in sex-for-drugs behaviour (Fullilove, Lowns, and Fullilove 1992). The manipulation of the sex worker's addiction to drugs limits free movement into and out of the occupation and represents coercion.

Structural obstacles

A number of studies of sex workers noted that condom use is reduced because of friction and pain associated with repeated use of condoms and because sex frequently takes longer when condoms are used. Both of these factors increase the price of condom use to the sex worker. One solution to the problem of irritation and pain is to make nonirritating lubricants more cheaply and widely available. Another possibility is to make female condoms and intravaginal microbicides more widely available. These are complements to condoms in the production of safer sex.

Section Four: Conclusion

It is important to realise that even well-designed and competently instituted policies cannot eradicate sex work. As Wirawan, Fajan, and Ford (1993) say, there will always be a ready supply of commercial sex workers among poor rural women. Relative deprivation, low education, and relatively high pay in sex work coupled with well-established (and therefore low-cost) paths to jobs as urban commercial sex workers mean that the appeal of commercial sex work, particularly for women, will persist for the foreseeable future. Even with legal restrictions on demand, it seems unlikely that the sorts of price increases needed to eradicate (or even severely limit) commercial sex work will occur. Since policies to affect demand and supply are unlikely to have very large effects, it is important that much attention be given to making sex work safer.

Policies that have a lot of public and political appeal often do not attack the underlying causes of commercial sex and may actually increase risk and the spread of HIV and other STDs. For example, crackdowns on brothels may decrease demand in the direct sector but increase it in the indirect sector, where risk levels may be higher. In general, growth in the indirect sector bodes ill for making sex work safer, as behaviour is typically riskier and harder to monitor or regulate in the indirect sector of the market.

To some extent, there are self-regulating mechanisms present. As the prevalence of HIV increases, condom use rises, at least in countries in which the price of condoms is relatively low. In poor countries, increased availability and lower condom prices, for example, through subsidies, will allow the substitution of safer sex for unprotected sex. This substitution can be reinforced by policies that dictate condom use in sex establishments and the enforcement of such legislation. By improving the bargaining position of sex workers such legislation may help counter the fact that at least some men are willing to pay higher prices for unprotected sex.

Other ways to increase this bargaining position are education and improved economic alternatives for women. Increased education does not prevent women from entering the sex industry if other factors are conducive to it but it does expand women's choices and increases their knowledge of risks. Over and Piot (1993) observed that the highest seroprevalence rates were found in those nations with the poorest record on female education. They concluded that one of the most promising ways to fight STDs over the longer run is to improve female education. It should be noted that increasing education will lead to an increase in age at marriage and perhaps to an increase in the demand for commercial sex. This underscores the importance of policies designed to increase safer sexual practices.

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10

Injecting drug use and AIDS in developing countries

by Kara S. Riehman

Section One: Introduction

Drug use has played a critical role in the spread of the human immunodeficiency virus (HIV) in many developing countries and threatens to become an important vector for HIV transmission in others. The high level of HIV infection among injecting drug users (IDUs) poses a major health problem of international concern. Drug users also function as a 'bridge' for HIV transmission to the heterosexual population and to children through perinatal transmission.

Some governments have made an extensive effort to address HIV among drug users by providing needle exchange programmes, methadone treatment facilities, and information and education campaigns that promote needle and syringe disinfecting techniques. Other governments have been hesitant to recognise the problem. Policymakers must have an understanding of the patterns and determinants of drug use and factors leading to the spread of HIV in this group in order to design effective prevention strategies.

This paper provides a review of the literature on injecting drug use and HIV in developing countries. First, HIV infection among injecting drug users in various countries is presented. The second section focuses on the role of IDUs in introducing HIV into the general population and behavioural risk factors associated with HIV transmission. The third section discusses specific practices that facilitate the spread of HIV among IDUs. In the fourth section, interventions to reduce HIV transmission among IDUs are reviewed, including harm reduction programmes and policies and programmes to reduce the demand for and supply of drugs. Finally, I will review issues to consider when developing HIV policies and programmes targeted to injecting drug users. Several countries have an opportunity to reduce the likelihood of full-scale HIV/AIDS epidemics by quick action, featuring targeted, proven interventions to injecting drug users; however, political and cultural factors may constrain governments and nongovernmental organisations (NGOs) in developing HIV prevention strategies.

Section Two: HIV infection among injecting drug users

2.1 HIV prevalence among IDUs

Table 1 presents estimates of HIV prevalence among IDUs in developing countries. In some locations where injecting drug use is found, such as Hong Kong, Nepal, and Singapore, HIV is virtually nonexistent, while in other areas, such as Brazil, Thailand, Manipur State of India, and Yunnan Province of China, levels of HIV infection in IDUs have stabilised at 50 per cent or higher. The highest rates have been found in Ruili in Yunnan Province at 82 per cent in 1991 (Zheng et al 1993); Chiang Rai in northern Thailand at 61 per cent in 1989 (Poshyachinda 1992); the state of Manipur, India, at 73 per cent in 1992 (Sarkar et al 1993); and several towns in Myanmar, including Yangon (74 per cent), Mandalay (84 per cent), and Myitkyina (91 per cent) (Department of Health 1993, cited in Stimson 1994b).

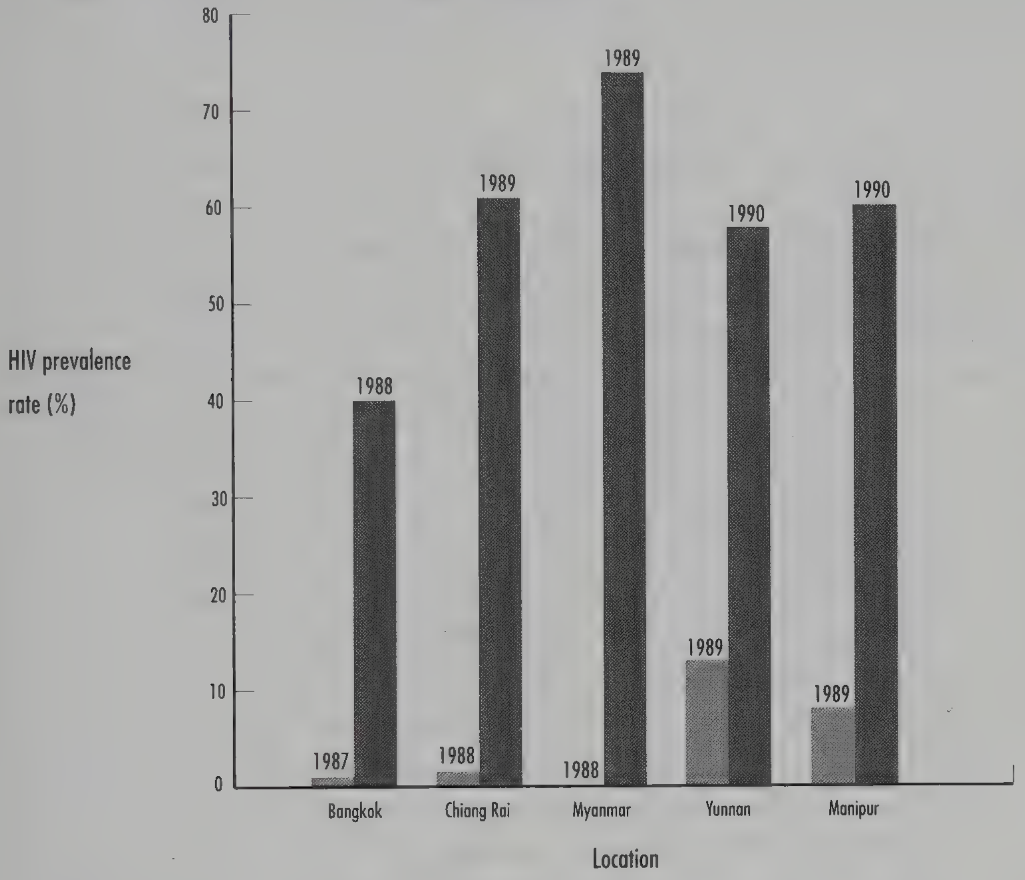
Table 1. HIV prevalence among IDUs in selected developing countries (per cent)

Region/ Country/City	HIV prevalence	Region/ Country/City	HIV prevalence
East Asia		**South Asia**	
Myanmar	74.3	India	55.0
Mandalay	84.0	*Manipur*	73.0
Myitkyina	91.0	*Mizoram*	6–10
Yangon	74.0	*Nagaland*	50.0
Taunggyi	38.0	Nepal	1.0
Thailand	38.0	**Latin America and the Caribbean**	
Bangkok	34.6		
North	28.6	Brazil	33.0
South	39.3	*Rio de Janeiro*	35.0
Malaysia	19.8	*Santos*	62.0
China	13.3	Argentina	32.8
Yunnan Province	43–82	Uruguay	13.7
Vietnam	8.7	Bahamas, The	13.4
Ho Chi Minh City	40–44	Trinidad and Tobago	4.7
Nha Trang	90.0	Mexico	1.3
Philippines	1.6	**Africa**	
Hong Kong	1.0	Egypt	7.6
Singapore	0.2	South Africa	0.6
Taiwan	0.1		

Source: US Bureau of the Census 1995 for all figures except the following: Myanmar and cities (Department of Health 1993, cited in Stimson 1994b); Manipur (Sarkar et al 1993); Mizoram, Nagaland (Jain et al 1994); Yunnan Province (Zheng et al 1994); Bangkok, North, South (Brown et al 1994); Rio de Janeiro, Santos (WHO 1994); Ho Chi Minh City, Nha Trang (Hien 1995); Hong Kong (Ch'ien 1994).

HIV can spread very rapidly among IDUs, going from 0 to 50 per cent HIV prevalence in six months in some cases (figure 1) (Brown et al 1994; Des Jarlais et al 1992; Jain et al 1994; Narain et al 1994; Poshyachinda 1993; Sarkar et al 1991, 1996; Stimson 1993, 1996).

Figure 1. Rapid diffusion of HIV among IDUs



Source: Stimson (1996).

2.2 The role of IDUs in specific HIV epidemics

Injecting drug use is an important mode of HIV transmission in both Asia and South America. In China, about 70 per cent of all HIV infections are among IDUs. The proportion of HIV cases attributed to IDUs is also substantial in Brazil at 27 per cent, and in the Southern cone countries of Chile, Argentina, Uruguay, and Paraguay at 30 per cent. In India, IDU-related HIV infections make up about 6 to 20 per cent of all HIV infections nationwide. However, most of the HIV-positive cases from the states of Manipur, Mizoram, and Nagaland are among IDUs (Narain et al 1994; Sarkar et al 1993). The HIV epidemic in Myanmar, one of the most serious in Southeast Asia, began with the infection of large numbers of IDUs in the late 1980s, with prevalence rates in this group continuing at 60 to 70 per cent since 1992 (AIDSCAP et al 1996).

The dynamics of the epidemic spread in Asia have been reconstructed (Stimson 1994a). The first cases of HIV among IDUs were identified in Bangkok in 1987, with subsequent rapid spread in this city in 1988. Eight months later, the pattern was repeated in southern Thailand near the Malaysian border and in northern Malaysia. Also within eight months, HIV among IDUs spread to northern Thailand. To the south, the first cases of HIV among IDUs were identified in Singapore two years later in 1990. HIV infection was identified in Myanmar and Yunnan in 1989 and also in Manipur (which is on the direct heroin trading route from Myanmar) at this same time.

Section Three: Role of IDUs in introducing HIV into the general population

3.1 Sexual behaviour of IDUs

HIV is spread from IDUs to the general population through unprotected sexual contact. Virtually all studies of risk behaviour among IDUs in both developed and developing countries find that they are sexually active, having both injecting and non-injecting partners, and use condoms infrequently (Anthony et al 1991; Cavallari et al 1994; Chitwood et al 1995; Jain et al 1994; Lima et al 1992; McBride et al 1996; Narain et al 1994; Sarkar et al 1993; Sarkar et al 1996; Schoenbaum et al 1989; Singh, S., et al 1993; Surratt et al 1996; Vanichseni et al 1991; Zheng et al 1994). While most studies find that there is a stronger association between injecting behaviour and HIV seropositivity, some do indicate that sexual behaviour contributes to HIV risk among IDUs (Chitwood et al 1995; Choopanya et al 1991; Robles et al 1992).

The WHO Multi-City Study on Drug Injecting and Risk of HIV Infection (1994) found high levels of sexual activity and low levels of condom use among IDUs in Rio de Janeiro and Santos, Brazil, and Bangkok, Thailand. In Rio de Janeiro and Santos, about 80 per cent of IDUs had sex on at least a monthly basis, and in Bangkok this was 52 per cent. Of those reporting sexual activity, many had sex with casual partners. About 28 per cent of IDUs in Bangkok had sex with casual partners on at least a monthly basis. In Rio de Janeiro, about 70 per cent of IDUs reported having monthly casual partners, and in Santos, this number was more than 50 per cent. Of those reporting sexual intercourse, however, many IDUs reported never using condoms with casual partners (about 45 per cent in Bangkok and Santos, and 70 per cent in Rio de Janeiro). Low rates of condom use among IDUs have also been reported in Malaysia and Yunnan Province, China (Singh, S., et al 1993; Zheng et al 1994).

In Manipur, India, an area that has experienced an explosive spread of HIV among injecting drug users, 50–70 per cent of injectors reported sexual experiences within the last five years (Sarkar et al 1993). The median number of heterosexual partners was three in the five years before the study. Although sexual activity among the drug using population was lower than the general population, there was still evidence of at least some sexual activity in this group. In addition, condom use was extremely low, with only 3–5 per cent of injectors reporting even occasional use of them.

Another study in India found that more than 30 per cent of married male and female injecting drug users had extramarital sex, and less than 2 per cent of them used condoms (Sarkar et al 1996). Data on rates of condom use among IDUs and non-injecting drug users indicate that rates may be lower among injectors. One study in Delhi, India, revealed that condom use among IDUs was lower than among non-injecting drug users (Kumar et al 1996).

3.2 Sexual contact with commercial sex workers

There is also evidence that IDUs have sexual intercourse with commercial sex workers. Research in India has found that 50 per cent of IDUs in Mizoram had multiple partners, including prostitutes (Narain et al 1994). In Manipur, 10–16 per cent of injecting drug users have a history of exposure to commercial sex workers (Sarkar et al 1993). In Thailand, 24 per cent of HIV-infected male IDUs in 1989 had had commercial sex, with a mean of 3.2 commercial sex workers in the previous 6 months (Vanichseni et al 1991).

The prevalence of injecting among prostitutes is another important factor when examining the role of IDUs in introducing HIV into the general population. In some cities, such as New York (Des Jarlais et al 1989a) and Rio de Janeiro (Lima et al 1994), HIV was probably introduced into the local area from men who have sex with men (MSM) and then spread to the IDU population from MSM who also inject drugs. Injecting is a common practice among male and female prostitutes as well as among male transvestites engaged in prostitution in some cities in Brazil and Columbia (Inciardi and Surratt 1996; Lima et al 1992; Perez-Gomez 1995; Surratt et al 1996).

In a sample of male sex workers from Rio de Janeiro, 26 per cent injected cocaine, 28 per cent tested positive for HIV, and 66 per cent self-identified as either bisexual or heterosexual, having a median of 3 partners in the 30 days prior to the interview. Among male transvestite sex workers interviewed in this same project, 64 per cent were HIV-positive, with injecting drug use the only statistically significant factor related to seropositivity. These transvestites engage in both receptive and insertive anal sex with primarily heterosexual male clients, and thus may play a role in the heterosexual transmission of HIV (Inciardi and Surratt 1996; Surratt et al 1996). The HIV seropositivity in these particular groups of injectors and their sexual behaviour clearly place the larger population at risk for contracting HIV.

3.3 Transmission rates from IDUs to the general population

IDUs can transmit HIV to their heterosexual partners and, through these partners, to children. The pattern found in most countries is that once HIV infection is well-established in the IDU population, they act as a ‘bridge’ through which HIV reaches the wider heterosexual population (Des Jarlais

1992; Lima et al 1992). Prevalence data and additional research in certain areas show that HIV has begun to spread from the high-risk population of IDUs to the general population. HIV seroprevalence of 0.5–1 per cent among pregnant women in the city of Bombay and in the state of Manipur, India, was found in 1991, just a few years after the first AIDS cases were found (Lal 1994; Singh, B.N., et al 1993).

In Manipur, the majority of AIDS cases have occurred among the IDU population, so it is likely that HIV in pregnant women has been transmitted mainly through IDUs. Among non-injecting sexual partners of IDUs tested, 6 per cent were found to be HIV-positive within two years of the first HIV case in the IDU population (Sarkar et al 1993). HIV among heterosexual partners of IDUs has also been observed in Yunnan Province, China. Researchers interviewing both IDUs and their spouses in three counties found that 49 per cent of IDUs were HIV-positive, none of the wives of IDUs used condoms, and 10 per cent of the wives were HIV-positive. Based on the duration of infection among IDUs, it was estimated that the heterosexual transmission rate was 6.4 per cent per annum per person (Zheng et al 1994).

As HIV epidemics mature, transmission from IDUs to their wives and sex partners becomes the most important route of infection among females, as has occurred in some developed countries (AIDSCAP 1996). For example, the United States experienced an increase in AIDS cases among heterosexual partners of IDUs throughout the 1990s (Morbidity and Mortality Weekly Report 1996). From 1990 to 1991, cases in this group increased 23 per cent among women and 19 per cent among men. While the annual increases in the number of cases associated with IDUs continue to occur, these increases have been progressively smaller while AIDS incidence among heterosexual partners of IDUs has continued to increase steadily.

3.4 Models of transmission from IDUs to the general population

HIV transmission from IDUs to the general population depends on 'mixing', that is, the extent to which injecting drug users practice sexual activity only among themselves (assortative mixing) or with non-injecting drug users (disassortative mixing). The shape of the AIDS epidemic curve (i.e., how fast prevalence rises, when it plateaus, and the difference in saturation among distinct groups) depends on proportions of the population in high-, medium-, and low-risk groups and the pattern of mixing that occurs. When relatively few individuals comprise the high risk group, and where little mixing occurs, the epidemic curve will have multiple peaks. The first peak develops for the high-risk group, followed by a period of declining incidence of HIV after saturation in this group, followed by a much larger epidemic of longer duration in the low-risk group (Anderson 1996).

HIV seropositivity among IDUs tends to increase rapidly, then plateau in some areas (e.g., Bangkok, Thailand, and Manipur, India). Following this is another major wave involving women in low-risk groups (as seen in HIV prevalence among women attending antenatal clinics in India). This implies that, first, a period of decline in incidence among a high-risk group does not signify the end of the epidemic, and second, the pattern of mixing is influential in determining the epidemic.

Anderson (1996) simulated a model of the AIDS epidemic in the heterosexual community in a developing country. Although he used commercial sex workers as the high-risk group, the same model can be applied using injecting drug users. He assumed moderately assortative mixing (e.g., injecting drug users have sex with both injectors and non-injectors) and found that HIV saturation in the high-risk group occurred about 40 years before saturation in the general population (assumed to be in a low-risk category). If mixing had been weakly assortative to random, HIV saturation in the low-risk group would have occurred much earlier.

Clearly, the key variable determining the spread of HIV from IDUs to the general population is mixing: the more assortative the pattern of mixing, the less the degree of spread to the general, low-risk population. Even limited disassortative mixing (mixing with individuals from a different, or non-risk, group) results in a sustained prevalence level in the general population for a period of many years. However, relatively little is still known about the sexual networks of IDUs and whether their sexual partners tend to be in high-, medium-, or low-risk groups. Until more research on sexual networks is done, it is not possible to predict the extent to which injecting drug use has fueled the AIDS epidemic.

Section Four: Factors that facilitate the spread of HIV among injecting drug users

4.1 Injecting practices and HIV risk

HIV is transmitted among injecting drug users primarily through the sharing of infected injecting equipment, including needles, syringes, and other paraphernalia, such as 'cookers' (spoons or containers for dissolving the drug), 'cottons' (filters), and wash water used to rinse needles and syringes and dissolve drugs (Chitwood et al 1990; McCoy and Inciardi 1995). When drugs are injected intravenously, contact between the paraphernalia and the user's blood is virtually guaranteed. In addition, certain sharing practices among IDUs contribute to HIV risk. 'Booting' is a process that uses a syringe to draw blood from the user's arm, mixes the drawn blood with the drug already taken into the syringe, and injects the blood-drug mixture into the vein. Booting leaves traces of blood in the needle and syringe, thus placing subsequent users of the equipment at risk (McCoy and Inciardi 1995).

'Frontloading' and 'backloading', also called 'syringe-mediated drug sharing', refer to a practice where two or more IDUs use one syringe to prepare the drug, then divide it by squirting some of the solution into one or more additional syringes. The drug is transferred by either removing the needle of the recipient syringe (frontloading) or removing the plunger (backloading). Although these practices do not involve sharing the actual needle or syringe, HIV can be transmitted if the syringe used for mixing has been previously contaminated (Stark et al 1996).

In addition to injecting with syringes, IDUs in some areas also use self-made equipment to inject their drugs. For instance, in parts of Southeast Asia, IDUs inject with blow tubes, which are lengths of polythene tubes with needles attached; drip sets; eyedroppers or inkdroppers with an attached needle; and disposable and glass syringes. In Mandalay, in 1989, 52 per cent of IDUs reported using self-made equipment (Stimson 1994b). IDUs in India have also been observed using inkdroppers as injecting equipment (Sarkar et al 1993). This self-made equipment is often in poor condition and difficult to sterilise.

Research has found that IDUs in developing countries do share injecting equipment to a large extent. The WHO Multi-City Study of drug injecting, conducted from 1989 to 1992, provides extensive information on drug-related risk behaviours in Rio de Janeiro and Santos, Brazil, and Bangkok, Thailand, as well as in other cities in developed countries. Samples of drug injectors, both from treatment facilities and from the street, were taken and extensive data gathered on drug sharing and sexual behaviour. Fifty-five per cent of IDUs in Bangkok, 30 per cent in Rio de Janeiro, and 53 per cent in Santos shared equipment on at least a monthly basis (WHO 1994).

Researchers in India have also found evidence of extensive needle sharing among IDUs. Samples of injecting drug users from Manipur and Nagaland report regular sharing of equipment in 83–96 per cent of cases (Narain 1994; Sarkar et al 1993). Equipment sharing is also prevalent in Yunnan Province, China, with 100 per cent of a sample of 282 injecting drug users reporting sharing (Zheng et al 1994).

Given that injecting drugs with HIV-positive equipment virtually guarantees transmission of the virus, the important issues become exposure to infected equipment and behaviour or conditions facilitating exposure. One factor associated with rapid transmission of HIV among IDUs is the presence of a mechanism for 'efficient mixing', where IDUs have access to others' injecting equipment (Des Jarlais et al 1992). In parts of Southeast Asia, sharing often occurs in drug injecting shops, where IDUs pay a 'professional injector' to inject them with the shop's equipment. Shops tend to have only one set of equipment that is shared among the many IDUs who attend each day (Stimson 1994b). Other common injecting sites at which equipment is often shared include semi-public venues, such as private dwellings, parks and other open spaces, graveyards, and under bridges (Stimson 1996). Prisons are also locations for efficient mixing in some areas, including Bangkok (Des Jarlais 1992).

The venues for efficient mixing are similar to what are termed 'shooting galleries' in the United States. Shooting galleries are locations, usually in urban areas, where IDUs go to rent equipment when they do not have access to their own. Galleries are typically located in basement apartments, abandoned buildings, or in run-down apartments or hotel rooms (McCoy and Inciardi 1995). IDUs rent injecting equipment from the gallery operator and return the equipment after use. This equipment is usually not disinfected or cleaned before renting it to the next user. In cities that do not have shooting galleries, IDUs may rent equipment from the individual who sells them their drug, then return it afterward. This equipment is then passed on to the next IDU who purchases drugs from the dealer. Also, in cities where drug distribution and equipment are limited, IDUs gather together in groups to purchase and share drugs, using the same equipment (Des Jarlais et al 1992).

Researchers have found significant associations between exposure to HIV and the use of shooting galleries. In Miami, 10 per cent of used needles and syringes collected from shooting galleries were found to contain the HIV-1 antibody (Chitwood et al 1990). HIV was present even in needles on which there was no visible blood. In addition, laboratory tests indicate that HIV-1 may be present in other paraphernalia, including cookers, cottons, and wash water (McCoy et al 1996a).

The probability of an IDU becoming infected with HIV varies depending on HIV prevalence in the particular population and on sharing behaviour. McCoy and Inciardi (1995) calculated probabilities of an IDU encountering an HIV-infected needle or syringe, given a 10 per cent seropositivity rate among IDUs. A user shooting up just one time a day in a shooting gallery would have a 90 per cent chance of using an HIV-infected needle within 21.5 days. Shooting up three times a day reduces the amount of time for an encounter with a seropositive needle to seven days, and those shooting up five times a day would encounter an infected needle in just four days. Although this type of HIV infection probability has not been calculated for sharing venues in developing countries, in some areas, such as Myanmar, seroprevalence is so high among IDUs that many new injectors become infected within six months of their first injection experience.

The risk of HIV transmission among IDUs who share equipment is lower when equipment is cleaned and disinfected properly. There is some evidence that IDUs do clean their equipment; however, many use inappropriate techniques. The WHO multi-city report found that of those who shared equipment, in all three cities (Rio de Janeiro, Santos, and Bangkok) more than 60 per cent (of the 95 per cent who reported cleaning) used cold water most frequently, which is not an effective means of killing HIV. One study in Yunnan Province found that some IDUs sterilised their equipment through boiling it, and this was negatively associated with HIV infection (Xia et al 1994). However, researchers in Manipur, India, found that 62 per cent of IDUs never cleaned their equipment, and the majority of those who do primarily used tap water, which is an ineffective method. Bleach, which does disinfect injecting equipment, is not available as a household item in India, and so is not routinely used or promoted as a cleaning method.

4.2 Reasons for needle sharing

Ethnographic research has provided some insight into reasons that IDUs share injecting equipment. One study in Manipur, India, interviewed 47 current and ex-IDUs in 1995 (Eicher 1996). IDUs cited fear of arrest and harassment by police and community authorities as reasons for not carrying their own syringes and bleach. IDUs in Malaysia also reported that risk of police arrest from carrying paraphernalia were reasons they share (Kin 1995). In addition, IDUs tend to share equipment when they begin injecting, as they depend on others to teach them how to inject (Friedman et al 1989). The IDUs interviewed in both Manipur and Malaysia reported being injected by others for a period of time when they began injecting (Eicher 1996; Kin 1995).

4.3 Injection of cocaine vs. heroin

Some studies have found a possible association between cocaine injection and HIV (Friedman et al 1989; Kin 1995; Robles et al 1992). The physiological effects of drugs influence the pattern of use, where those who inject cocaine tend to do so more often compared to heroin injectors (Friedman et al 1990; Mann et al 1992; McCoy and Inciardi 1995). Heroin tends to be relaxing, and its effects last for several hours. Cocaine injection, however, produces a rapid stimulation that only lasts about 15 minutes. Observation of cocaine injectors indicates that the drug is injected frequently, up to four or five times an hour, resulting in 'binge' injecting that may last several days (Auerbach et al 1994; Friedman et al 1990; McCoy and Inciardi 1995). In addition, the frequency of use results in needles becoming dulled and clogged relatively quickly. Also, cocaine users tend to become confused about whose 'works' belong to whom. Both factors result in an increased likelihood of sharing with others (Friedman et al 1990; McCoy and Inciardi 1995).

Studies on the relationship between cocaine and heroin injecting have been inconclusive. It is not known whether the type of drug used is associated with the speed of HIV spread among the IDU population (Des Jarlais 1992). Many studies in the United States do show stronger associations between the frequency of cocaine injection and HIV infection compared to heroin injection (Des Jarlais and Friedman 1988; Garfein et al 1996; Novick et al 1989). Several studies have found a higher HIV seroprevalence rate among cocaine injectors than heroin injectors, even when controlling for other behavioural factors (Anthony et al 1991; Garfein et al 1996). These studies suggest potential serious HIV epidemics among IDUs in South America, where cocaine is the most common drug injected (Des Jarlais 1992; Lima et al 1992).

Despite some evidence that cocaine injection increases HIV transmission, however, the areas that have experienced the most rapid spread of HIV among IDUs are those in which heroin is the most common drug injected (Des Jarlais et al 1992). More research is needed to determine the exact relationship between the type of drug injected and HIV.

4.4 New IDUs

Most studies of risk factors for HIV among injecting drug users find that length of injecting is positively related to seropositivity, meaning that new IDUs are at less risk of HIV transmission than experienced IDUs (Friedman et al 1989). Two explanations for this are that either new drug users share injection equipment less often, or they share equipment primarily with other new users, who are less likely to be infected with HIV. However, some studies in developed countries have found that new IDUs practise risky injection behaviour, including sharing needles and syringes, more often than IDUs who have been injecting a long time. New IDUs are typically initiated into injecting by a relative or friend, who also tend to be new users, and are less likely to come into contact with experienced IDUs right away (Friedman et al 1989; WHO 1994).

Fear of AIDS does not seem to deter drug users from beginning to inject. Data from one study in the United States found that fear of AIDS is not yet a factor that affects the expectations of heroin sniffers as to whether or not they will start injecting (Des Jarlais et al 1989b). The WHO Multi-City Study (1994) found a high rate of new injectors among all IDUs. In Bangkok, 43 per cent of injectors had been injecting less than six years. In Rio de Janeiro, 47 per cent were new injectors, and in Santos, Brazil, 50 per cent of all injectors were new.

The term 'new injector' has different meanings, depending on the length of time the practice of injecting has been prevalent in a certain country. For instance, the practice of injecting has been prevalent in some developed countries since the 1960s, with some IDUs reporting injecting careers of up to 20 years (Des Jarlais et al 1992). In these countries, drug users who have been injecting only five years would be considered 'new'. However, in countries such as Myanmar, the practice of injecting has only been increasing since the late 1980s (Stimson 1994b). In such countries, all injectors can be considered 'new' injectors. This distinction is important in terms of knowledge of safe injecting practices and consequences of risky injection: in countries where injection is relatively new, users may not be aware that sharing equipment is a risk factor for HIV infection.

4.5 Socioeconomic status and HIV

Socioeconomic status can be considered a 'risk factor' in that it is related to HIV seropositivity in some areas. A study in Buenos Aires, Argentina, revealed that 66.2 per cent of IDUs of low socioeconomic status were infected, compared to only 36.6 per cent of drug injectors of higher socioeconomic status (Libonatti et al 1993). Des Jarlais et al (1992) note that social integration, as reflected in socioeconomic status, influences HIV risk behaviour among IDUs. In one study in the United States, IDUs with extremely low incomes were more likely to be infected with HIV (Schoenbaum et al 1989). In addition, of the 5,000 street addicts interviewed through the WHO Multi-City Study, IDUs who lived in shelters or boarding houses were more likely to be infected with HIV (Friedman et al 1991). Being a member of an ethnic minority is also associated with higher seroprevalence among IDUs in the United States and Amsterdam (Selik et al 1988, 1989).

A comparison of IDUs from New York and Bangkok also points out the importance of social integration in HIV risk. In New York, the majority of long-time injectors are unemployed and members of minority groups. However, in Bangkok, most IDUs are employed (70 per cent) and almost all belong to the ethnic majority. Bangkok IDUs were more successful in implementing risk reduction behaviour than those in New York (Des Jarlais et al 1992, 1995a). In addition, Neaigus et al (1994) examined social relationships and risk behaviour and found that injectors who had more frequent social contacts with non-injectors engaged in lower levels of injecting risk behaviour.

4.6 Other practices associated with HIV risk

Frequency of injecting and length of time as injectors also contribute to HIV risk (Friedman et al 1989). One study of IDUs in Puerto Rico found that injecting four times a day and injecting six or more years were associated with HIV seropositivity (Robles et al 1992). Another study done in Rio de Janeiro found that IDUs who injected four or more times a week or have been injecting drugs for more than five years were significantly more likely to be HIV-positive (Telles et al 1992). Researchers in Argentina also found that the length of time of drug use was significantly associated with HIV serostatus (Bonhevi et al 1993). Duration of drug injecting for more than five years was also related to HIV seropositivity among a group of IDUs studied in Malaysia (Kin 1995).

4.7 Countries at risk

Examination of the factors that influence the global spread of injecting and rapid transmission of HIV indicate that countries in which injecting drug use is increasing or already prevalent are at risk for HIV transmission among IDUs. Southeast and Southwest Asian countries are particularly vulnerable. These countries are located near centres of heroin production (the Golden Triangle and the Golden Crescent). Researchers believe that injection will spread in Bangladesh, Cambodia, parts of China, Laos, Pakistan, and Vietnam, as other routes of drug trafficking are made difficult (Stimson 1993). Nigeria and other countries in Africa are also becoming drug transportation routes, which places them at risk for increased injecting. A third vulnerable area for HIV transmission among IDUs is South America, where local cocaine production has led to increased use and injection of this drug. Countries such as Columbia and Venezuela, which are experimenting with poppy growing and heroin production, have seen increases in injecting drug use (Perez-Gomez 1995; Stimson 1993).

Section Five: Interventions to reduce HIV among IDUs

Injecting drug users can and do change their drug use behaviour under certain circumstances. However, research indicates that while injecting drug users change their needle sharing and cleaning practices, HIV prevention efforts have not been successful in the realm of sexual behaviour, particularly with regard to condom use. IDUs still report low rates of condom use with their partners. Policies and interventions must focus on changing sexual risk behaviour change, as well as injecting risk factors. Interventions emphasising sexual behaviour change should target, at a minimum, the steady sexual partners of IDUs as well as the IDUs themselves.

There is a distinction among programmes intended to reduce the demand for drugs, those intended to reduce the supply of drugs, and those that reduce harm associated with drug use (particularly HIV), though not necessarily reducing the demand for or supply of drugs. Demand reduction programmes, which usually take the form of drug treatment facilities, focus on discouraging drug injection altogether. Risk or harm reduction interventions, on the other hand, involve encouraging safer injection behaviour, but do not necessarily promote abstinence from injecting drug use.

Generally, both demand and harm reduction interventions are implemented by public health departments and private organisations concerned with the welfare of drug users. Drug supply reduction strategies are typically national-level policies that focus on enforcement of laws against drug production, trafficking, sale, and use. Drug enforcement is usually the responsibility of national and local law enforcement agencies. These policies are not specifically aimed at reducing HIV among injecting drug users, but they may have unintended consequences for the patterns of drug use and HIV risk behaviour among drug users in different countries.

5.1 Harm reduction strategies

Des Jarlais (1995) summarised the argument for implementing harm reduction programmes to prevent HIV among IDUs. First, nonmedical use of psychoactive drugs is inevitable in societies that have access to these drugs. Therefore, drug policies cannot be based on the belief that drug use can be eliminated. Second, drug misuse will produce social and individual harms; therefore, drug policies cannot be based on the belief that drug users will use drugs safely. Third, drug policies must be pragmatic; that is, they must be assessed on their results, not on whether they are sending correct, incorrect, or mixed messages. Fourth, drug users are part of the larger society and, as such, should not be socially isolated from the community. And fifth, drug use leads to harms through a variety of mechanisms, all of which need to be addressed in interventions.

Effective risk reduction programmes for IDUs implemented in both developed and developing countries include educational programmes, drug abuse treatment, syringe exchange, over-the-counter syringe sale, and community outreach and bleach distribution programmes (Des Jarlais et al 1992, 1995b). Education and information alone may not cause a reduction in risky behaviour among IDUs (Becker and Joseph 1988; Campbell and Waters 1987; Flowers et al 1991). However, education, combined with group interactions and exercises, seems to be more effective (Jemmott et al 1992; McCoy and Inciardi 1995).

Behaviour is difficult to change in individuals when it is habitual and reinforced by peers or community norms. Many researchers agree that successful risk reduction programmes involve redefining traditional peer group norms (such as sharing needles) as unacceptable, with the new risk reduction behaviours as more appropriate (Auerbach 1994; and Inciardi 1995). In addition, there is growing consensus that effective prevention programmes should include the promotion of treatment for reducing drug use, providing the means for safer injection, and promoting safer sex (Des Jarlais and Friedman 1996).

Table 2 provides a summary of some harm reduction measures and evaluations of these in both developed and developing countries. These include needle exchange programmes (NEPs), bleach distribution, and programmes that rely on a community outreach and peer leader approach to service delivery.

5.2 Needle exchange programmes (NEPs)

Needle exchanges are established in order to increase the availability of sterile injection equipment and to remove contaminated needles from circulation (Normand et al 1995). These programmes are expected to increase the supply of needles and reduce the amount of sharing by IDUs. Needle exchanges also tend to include services such as education concerning risk behaviours, referral to drug treatment programmes, and provision of condoms.

Negative outcomes that conceivably could result from NEPs include an increase in improperly discarded needles, an increase in drug injectors, or the perception that the government condones drug use. Needle exchange programmes have been implemented in locations in a variety of developed countries. Two comprehensive reviews of literature that evaluated needle exchange programmes in Australia, Canada, the Netherlands, Sweden, the United Kingdom, and the United States were performed by the US General Accounting Office (1993) and the University of California at San Francisco in 1993 (Lurie et al 1993). The GAO review concluded that needle exchange programmes were successful in reaching injecting drug users and providing a link to drug treatment and other health services (Normand et al 1995). It also found consistent evidence of a reduction in needle sharing and a reduction in the frequency in injecting drug use in two programmes.

Table 2. Harm reduction programmes

Programme	City/Country	Evaluation source
Needle exchange	Australia, Canada, Netherlands, Sweden, UK, USA	Review of studies on evaluations of 9 programmes in these countries – US GAO 1993
	US, Canada, Europe	Review of evaluations and site visits to 33 programmes in 15 cities – Lurie et al 1993
	Kathmandu, Nepal	Maharjan et al 1994; Maharjan and Singh 1996
	New Haven, CT, USA	Normand et al 1995
Bleach distribution	San Francisco, CA, USA	Neaigus et al 1990; Watters 1994
	Chicago, IL, USA	Wiebel et al 1990
	Churachandpur, Manipur, India	Chatterjee et al 1996
	Kathmandu, Nepal	Maharjan and Singh 1996
Community outreach	Bangkok, Thailand	Choopanya et al 1991
	Churachandpur, India	Chatterjee et al 1996
	Kathmandu, Nepal	Maharjan and Singh 1996

The review conducted by the University of California of 33 needle exchange sites examined four possible positive outcomes, including reduction in drug-related and sexual risk behaviours, increase in referrals to drug abuse treatment, and reduction in HIV and other infection rates. The report also addressed the possible negative outcomes mentioned above. The review panel concluded that there was no clear evidence that NEPs decrease HIV infection rates, but that most of the IDUs who are involved in the programmes demonstrate reduced HIV drug risk behaviour, but not decreases in sexual risk behaviour (Normand et al 1995). In addition, most NEPs provided referrals to drug abuse treatment.

The report also concluded that NEPs do not increase the number of improperly discarded needles and have not resulted in an increase in the number of injecting drug users in the community. This latter result was determined by examining the ages of injectors. If NEPs have the effect of encouraging those not currently injecting to begin injecting, then an increase in the number of young newer injectors at the needle exchange programmes would be expected. This was not found to be the case (Lurie et al 1993). Evidence from other NEPs is consistent with these findings. Heimer et al (1993) assessed the effect of the New Haven needle exchange by examining demographic data obtained from programme participants from 1990 to 1991. They found that the mean age and mean duration of injection did not change over time.

In addition, researchers in Amsterdam examined the hypothesis that NEPs would provide a chance for non-injectors to 'mix' with injectors, thus increasing the opportunity for non-injectors to begin injecting (van Ameijden et al 1994). They found that the proportion of heroin users who smoke and those who inject have remained constant since needle exchanges were implemented in the city. US data also support the conclusion that NEPs do not increase the number of drug users. Watters (1994) found that in San Francisco, the mean age of injecting drug users actually increased between 1986 and 1992 (from 36 to 42), where a decrease in age would be expected if the number of newer injectors increased. The author also reported that the median frequency of injecting declined from 1.9 to 0.7 injections per day, and the percentage of new initiates into injection decreased from 3 to 1 per cent.

A needle exchange programme instituted in Kathmandu, Nepal, also provides evidence of harm reduction among IDUs as a result of participation in the programme. In this sample of 127 IDUs using an NEP, the mean frequency of injecting fell from 24.4 per week to 17 per week. Unsafe injections decreased by 50 per cent, the number of persons with whom equipment was shared decreased by 21 per cent, and the number of times equipment was shared decreased by 29 per cent. HIV prevalence among IDUs in Kathmandu also has remained low, at less than 2 per cent (Maharjan et al 1994).

In addition to reduced risk behaviour among participants in needle exchange programmes, there is evidence of reduced infectivity of the syringes exchanged through NEPs. Studies of the New Haven, Connecticut, needle exchange programme reveal that prior to the distribution of sterile injecting equipment, the HIV-positive rate of syringes collected from the street was 0.675 and 0.917 from shooting galleries (Normand et al 1995). Within three months, the HIV-positive rate for returned needles decreased by one-third.

Some cities with high seroprevalence have seen a substantial reduction in needle sharing practices, resulting in stabilisation of HIV seroprevalence among IDUs (Des Jarlais 1992; Watters 1994). Much of the success is attributed to the availability of clean needles through both exchange programmes and legal over-the-counter sales. For example, trends in injection behaviour among IDUs in Bangkok, where HIV prevalence in this group is estimated at about 37 per cent, the percentage of IDUs reporting injecting once a month or more with used needles fell from 39 per cent in 1989 to 22 per cent in 1993 (Suwanee et al 1994). One important factor in reduced sharing of injection equipment appears to be ready access to sterile equipment (Des Jarlais et al 1992). Legal sale of needles also contributes to a decline in risk behaviour. In the state of Connecticut, USA, needles have been available from pharmacies without a prescription since 1992. Between 1992 and 1995, the percentage of IDUs who share needles decreased from 71 per cent to 15 per cent (Span 1996).

While safer injection programmes appear to reduce HIV risk behaviour among IDUs, they have not resulted in the complete elimination of HIV transmission in this group (Des Jarlais 1992). Three unsolved problems are linked with such safer injection programmes as needle exchange. First, many IDUs, particularly new injectors, are not reached by these programmes. The second problem is consistent provision of clean equipment so that IDUs using the programme have access at the times when they are most likely to inject. The third problem is the propensity of IDUs to relapse back into unsafe injecting behaviour after a certain amount of time of safe injecting.

5.3 Costs of needle exchange programmes

Lurie et al (1993) estimated that the median cost per participant contact across seven needle exchange programmes was US$1.35. This is consistent with WHO (1993) estimates of needle exchange programmes in Nepal and Tacoma, Washington, USA. The total costs for the NEP in Nepal after one year of operation was estimated at US$7,333, and the cost per client contact (of a total of 2,287 contacts) was US$3.21 (WHO 1993). This cost is only slightly higher than costs of the Tacoma Needle Exchange in Washington, which were estimated at US$2.25 per contact.

Lurie et al (1993) also attempted to measure the cost-effectiveness of programmes by estimating the number of HIV infections averted and associated cost-effectiveness (programme cost divided by number of HIV infections averted). They estimated the cost-effectiveness of a hypothetical NEP with specific characteristics (high volume of needles exchanged, limited counselling and referral services) using three different models: one that only took into account HIV infections attributable to needle sharing, one that included averted infections among injectors as well as their sexual partners and offspring, and one that combined characteristics of both. All three models estimated that the hypothetical needle exchange programme had a large impact on averted infections and cost substantially less than the US$119,000 estimated lifetime medical costs associated with HIV (US$12,000, US$3,773, and US$9,375, respectively, for each model).[1]

NEPs may also have beneficial economic effects. There is some evidence that these programmes reduce local government spending on law enforcement, as NEPs can refer IDUs into treatment facilities, reducing the number incarcerated and the incidence of HIV. One study compared the costs of medical treatment for HIV-positive jail inmates with the cost of operating an NEP in San Diego, California (Hernandez et al 1996). Researchers found that the annual excess medical cost for treating HIV-positive IDUs was US$15,768 per person, or US$5.3 million for all infected IDUs in the area. Operational costs for San Diego's underground NEP totalled US$14,000 per year to provide clean needles to 2,500 clients. Prevention of one HIV infection per year among incarcerated IDUs would balance the costs of the NEP, and any additional savings from decreased jail recidivism would result in additional economic benefits.

5.4 Bleach distribution

Use of bleach has long been recognised as an effective technique for sterilising injecting equipment. Many bleach distribution programmes are incorporated into needle exchange programmes and tend to rely on a community outreach approach. Bleach distribution programmes in San Francisco and Chicago were instituted in the 1980s (Watters 1987, 1994; Wiebel et al 1990). In the San Francisco programme, the share of IDUs in the programme who used bleach increased from 3 per cent to 76 per cent (Watters 1994). Similarly, in Chicago, two-thirds of IDUs in the programme reported an increase in bleach use, and one-third of those reported always using bleach (Wiebel et al 1990).

A bleach distribution programme was also instituted in Churachandpur, Manipur, India. Bleach kits are distributed on the street by outreach workers. In the first year of the intervention, it was estimated that 790 of the town's 800 IDUs were reached and knowledge of bleach as a disinfectant rose from 3 per cent to 99 per cent. Intention to use bleach also increased from 2 per cent to 79 per cent, and actual use of bleach increased from 31 per cent to 72 per cent (Chatterjee et al 1996). For countries where sterile needles are difficult, if not impossible, to obtain for injecting drug users (for both economic and political reasons), bleach distribution may be a viable and effective alternative.

5.5 Peer counsellors/community outreach

Outreach programmes and utilisation of peer counsellors are not distinct interventions, as many harm reduction programmes use these strategies. Outreach has been successful in cities in the United States and Europe as well as in developing countries, resulting in marked decreases in needle sharing (Des Jarlais et al 1992). In Hong Kong, where HIV seroprevalence among IDUs is very low, rehabilitated IDUs are trained as interviewers and peer counsellors to educate injectors on the street about harm reduction techniques. Analysis indicates a rising awareness of risk factors among these IDUs and declining risk behaviour (Ch'ien 1994). Harm reduction programmes in Churachandpur, Manipur, India, and Kathmandu, Nepal, both incorporate community outreach strategies. The low seroprevalence of HIV among IDUs in Kathmandu has been partly attributed to a street-based outreach strategy (Maharjan and Singh 1996).

Bangkok has also experienced some success in risk reduction among IDUs after instituting AIDS education programmes in treatment centres and through community outreach. In 1989, 92 per cent of IDUs interviewed reported that they had changed their behaviour to reduce their risk for HIV (Choopanya et al 1991). In addition, 80 per cent said they obtain their injection equipment from a pharmacy instead of from other IDUs. HIV prevalence in this population has stabilised since 1991 at about 37 per cent.

The importance of the peer outreach model is evidenced by the role of social integration, social networks, and norms in risk reduction among IDUs. In Bangkok, 70 per cent of IDUs are employed and in the ethnic majority. IDUs in this city were more successful in changing needle sharing practices than were a comparison group of IDUs from New York City, where most are not employed and are in the ethnic minority (Des Jarlais et al 1992). In addition, among IDUs in Bangkok, having a regular sexual partner, an indicator of social integration, had a protective effect against seroconversion (Des Jarlais et al 1994). Another study of outreach efforts in Bangkok and Rio de Janeiro, Brazil, found that social network factors were important in influencing behaviour change among IDUs (Des Jarlais et al 1995a). Talking about AIDS with drug using friends was significantly related to behaviour change in both cities.

In addition, talking with sex partners about AIDS, having years of education, and knowing that someone can have AIDS and look healthy were related to behaviour change. In both cities, there is evidence that large-scale behaviour change among IDUs is associated with stabilisation of HIV seroprevalence and decline in HIV incidence. The results suggest that AIDS prevention programmes for IDUs should take into account social influences of peers and family.

Another study done on IDUs from Manipur, Nagaland, and Mizoram states in India found that the most important reasons cited by 60–90 per cent of injectors for initiating injecting drug use were peer pressure and the influence of friends (Sarkar et al 1993). This points to the potential for successful behaviour change using peer leaders to influence IDUs.

5.6 Risk reduction in sexual behaviour

Most studies find that IDUs are sexually active and that most IDUs report non-IDU heterosexual partners (Donoghoe 1992). However, condom use among IDUs is infrequent. While IDUs have been able to change their drug using behaviour to reduce their risk for HIV, there has been less success in changing their sexual behaviour.

Early studies from the UK, New York, San Francisco, Amsterdam, and Edinburgh reported higher rates of risk reduction in needle sharing and cleaning practices than in sexual behaviour (Donoghoe 1992; Hart et al 1989; Morrison 1988; Van de Hoek et al 1990). More recently, results from the WHO Multi-City Study found that among IDUs interviewed in Rio de Janeiro, only 29 per cent reported a change in sexual behaviour, compared to 53 per cent who reported changes in drug injecting behaviour, due to concern about AIDS (Des Jarlais et al 1995a).

In addition, a study in Manipur found that widespread availability of HIV testing and awareness of HIV seropositivity were not associated with safer sex behaviour. Of 787 IDUs who were provided HIV testing and counselling, 93 per cent reported being aware of HIV transmission through sex, and 37 per cent tested positive for HIV. However, only 16.5 per cent of sexually active IDUs had ever used condoms, even after testing and counselling (Sarkar et al 1996).

While risky sexual behaviour among IDUs remains prevalent, changes on a limited scale have been observed. Some studies have found an association between knowledge of HIV status and sexual behaviour change. For example, one study in Puerto Rico found that drug users (both IDUs and crack smokers) who tested positive for HIV were less likely than those who tested negative to report sexual activity with their steady partners (57 vs. 73 per cent). Of those who were sexually active, 57 per cent of those who were HIV-positive used condoms compared to only 13 per cent of those who tested negative. However, there were no significant differences between HIV-positive and HIV-negative drug users in the use of condoms with casual partners (Colon et al 1996).

Among IDUs and crack smokers interviewed from a drug treatment centre in Campinas, Brazil, 36 per cent reported more frequent condom use and 28 per cent reduced their number of sexual partners because of the AIDS epidemic (Azevedo-Renata et al 1996). Research in developed countries also reveals that there has been limited change in sexual behaviour among IDUs, mostly decreases in numbers of sexual partners and small increases in condom use (Donoghoe 1992).

Another study in Bangkok compared IDUs who tested HIV-positive, those who tested negative, and those who were not tested (Des Jarlais et al 1992). A greater percentage of IDUs who tested HIV-positive compared to the other two groups reported always using condoms with their primary partner (29 per cent v. 11 and 9 per cent, respectively) and always using condoms with their casual partners (57 per cent v. 30 and 33 per cent, respectively). However, there were still a great many HIV-positive IDUs who did not use condoms – 29 per cent never used condoms with their main partner or casual partners, and more than 40 per cent used them only sometimes.

Researchers recognise that HIV interventions targeted to IDUs must incorporate specific sexual behaviour components in order to reduce this type of risky behaviour. Interventions that include the partners of IDUs in the sexual behaviour component have met with some success (Auerbach et al 1994; Des Jarlais et al 1992; Donoghoe 1992; McCoy and Inciardi 1995). The Miami Community Outreach intervention, which started in 1988, targets both IDUs and their sexual partners and includes both drug use and sexual behaviour components. Some changes were noted among half the women enrolled. However, others made no changes, and in a minority, increased HIV risk was reported (McCoy et al 1993).

A community-level intervention in California targeted women at high risk for HIV (injecting drug users, commercial sex workers, and sex partners of IDUs). By the end of the study, women who had been exposed to the intervention were significantly more likely to report consistent condom use with both main partners and non-main partners (Corby and Wolitski 1996).

5.7 Harm reduction strategies associated with low seroprevalence

Some cities in both developed and developing countries have been able to maintain low seroprevalence among IDUs (< 5 per cent) (Ch'ien 1994; Des Jarlais et al 1995b; Lee et al 1993; Poshyachinda 1993; Wong et al 1993). Three common prevention components are present in at least five of these cities (including Glasgow, Scotland; Lund, Sweden; Sydney, Australia; Tacoma, Washington; and

Toronto, Canada) that may help explain this phenomenon (Des Jarlais et al 1995b). First, prevention activities were implemented when HIV seroprevalence was still low. Second, sterile injection equipment is made available on a large scale, either through needle exchange programmes or legal over-the-counter sale of needles and syringes. Third, community outreach programmes, which disseminate AIDS information and risk-reduction supplies to IDUs, exist in these cities. Through outreach, trust is built between IDUs and health care workers, and outreach workers provide referrals to other services, such as drug abuse treatment, and HIV testing and counselling.

The experience of these cities demonstrates that introduction of HIV into the injecting drug using population does not necessarily lead to rapid transmission of HIV in this group. The factors discussed above may be instrumental in preventing the spread of HIV in countries that are already experiencing rapid spread and in those that may experience rapid spread in the future.

The above criteria can be used to compare the different HIV prevalence rates among IDUs in countries in Asia. To date, some economies, including Hong Kong and Nepal, have experienced very low HIV prevalence rates among IDUs. In other countries, such as Thailand, China, India, Myanmar, and Vietnam, HIV has increased rapidly among IDUs, reaching prevalence levels above 50 per cent. Comparing Hong Kong (where almost no HIV cases have been found among IDUs) and Thailand (where seroprevalence levels among IDUs increased rapidly and stabilised at about 35–40 per cent) highlights some important differences in treatment of IDUs. In Hong Kong, injecting drug use has been common since the 1950s and in Thailand since the 1960s. Methadone clinics have been in operation in Hong Kong since 1972 (Choi et al 1996), while there have been very few methadone facilities in Thailand until recently (Des Jarlais 1992).

Very few IDUs in Hong Kong report a history of needle sharing. One survey of more than 18,000 IDUs found that only 8.6 per cent had ever shared needles in their drug taking history, and most sharing occurred only during their initiation into injecting (Choi et al 1996). Needle sharing in Thailand is much more common, however. One study revealed that more than 50 per cent of IDUs in Bangkok reported using a needle or syringe that had been used by someone else in the last 6 months (WHO 1994). Thailand has experienced risk reduction among IDUs in the absence of wide-scale needle exchange programmes or methadone maintenance, but seroprevalence has stabilised at relatively high levels (Des Jarlais et al 1992). While Hong Kong may yet experience increased HIV incidence among IDUs, the availability of methadone treatment prior to widespread introduction of HIV could have had a protective effect for IDUs there.

In addition, Nepal has taken early prevention measures for HIV among IDUs. In Kathmandu, where there are approximately 1,500 IDUs, extensive harm reduction programmes have been implemented since 1992 by a group called the

Lifesaving and Lifegiving Society. This NGO provides education, condoms, bleach, needle exchange, and primary health care to about 650 IDUs. They have built collaborations with the Ministries of Home Affairs and Health and with the law enforcement community, while ensuring a confidential and nonjudgmental atmosphere (Peak et al 1994). HIV seroprevalence among IDUs is very low, at about 1 per cent as of 1993 (US Bureau of the Census 1995). Whether seroprevalence remains low in the years to come may depend on continued and large-scale harm reduction efforts.

To summarise, early harm reduction efforts that are based on a community outreach approach, whether they consist of methadone treatment, needle exchange, or availability of sterile injecting equipment, are important components to the prevention of rapid spread and high seroprevalence among IDUs. However, the relative effectiveness of specific programme components is not yet known (Des Jarlais et al 1992). Many programmes provide multiple services, and it is difficult to identify behaviour change associated with each type of service. While intervention efforts have resulted in behaviour change in injecting practices, less success has been noted in interventions designed to change sexual behaviour.

5.8 Demand reduction strategies

Demand reduction as a strategy both reduces HIV risk and drug abuse (Des Jarlais 1992). Studies of methadone patients in New York City have shown that those who entered methadone treatment early in the HIV epidemic were less likely to be HIV-positive than IDUs who entered treatment later (Abdul-Quader et al 1987; Schoenbaum et al 1989). Other research has found an association between availability of methadone treatment and lower rates of HIV seropositivity (Blix and Gronbladh 1988; Rezza et al 1988). Methadone treatment has been associated with low levels of risk behaviour among IDUs in Hong Kong (Choi et al 1996). Only 1–2 per cent of the 18,000 injectors interviewed reported sharing needles in the last month, and of those, the majority (58–81 per cent) stopped sharing after counseling at the clinics.

In addition, Farrell et al (1994) reviewed studies of methadone treatment results and concluded that long-term methadone prescribing was an effective means to reduce injecting and sharing behaviour and rates of HIV infection, as well as to reduce dependence on illicit opiates, criminal activity, and drug-related mortality.

Demand reduction in the form of drug treatment is an important component to HIV prevention among IDUs and can be complementary to harm reduction strategies. Evaluations of needle exchange programmes have found that one important outcome is the provision of referrals to drug treatment (Normand et al 1995). The New Haven, Connecticut, needle exchange programme reported that participants requested drug treatment at a rate of 25 per cent, and the percentage entering treatment increased from

15 to 18 per cent after one year of programme operation (Normand et al 1995). These programmes, particularly those that rely on community outreach efforts, have become the leading local source of referrals into drug treatment (Hagan et al 1992; O'Keefe et al 1991).

Drug treatment programmes that encourage drug abstinence have significant limitations. Methadone treatment is opiate-specific and does not eliminate injection of drugs other than heroin (including cocaine). Also, the relapse rate in drug treatment centres is very high. For example, in drug treatment centres in both Kunming in Yunnan Province and in centres in Myanmar, the relapse rate has been reported to be between 80 and 85 per cent (McCoy et al 1996b; Stimson 1994b). In addition, follow-up is relatively unsuccessful due to geographical distance and transport and patients'unwillingness to attend.

One particular factor that may impact the high relapse rate is mandatory treatment, where IDUs are placed in treatment by law enforcement or by their families against their will. This raises not only ethical concerns, but questions of efficacy of HIV prevention through demand reduction. McCoy et al (1996b) studied the Kunming treatment centre in Yunnan Province, China. Eighty per cent of the patients at this drug detoxification facility are mandated by law enforcement to go, and many report not necessarily wanting to stop their drug habit.

Another problem with reliance on drug abuse treatment for HIV prevention is lack of appropriate facilities. For example, Myanmar has a yearly throughput capacity of about 2,000 to 2,200 for all drug abuse facilities countrywide. However, the number of registered drug abusers has been estimated at 20,000 to 100,000 (Stimson 1994b). In Manipur, India, IDUs are forced into treatment by law enforcement and family members (Sarkar et al 1993). Since there are a limited number of beds in the few treatment facilities that do exist, prisons are often used as detoxification centres. Imprisonment has not induced large-scale behaviour change, despite the fact that more than 50 per cent of addicts have been in prison in their lifetime. Abstinence from drugs, rather than harm reduction, is emphasised and no counselling support is available. In one survey of 450 injectors, only 2 per cent expressed a desire to stop their drug habit because of imprisonment (Sarkar et al 1993).

Finally, treatment programmes do not help those who refuse to go into treatment. They also tend to be expensive and take a long time to implement (WHO 1993). Harm reduction strategies may be equally or more effective than demand reduction programmes at reducing HIV transmission. These include education on the need to reduce needle sharing, instruction on cleaning and disinfecting injection equipment, and bleach distribution and needle exchange programmes (WHO 1993).

5.9 Drug supply/enforcement policies

Policies designed to curtail drug supply may have limited effectiveness, and in some cases may even cause a shift in drug transportation routes, thereby increasing the supply and use of drugs in areas around the new trade routes (Stimson 1993, 1996). For example, Mauritius experienced an increase in brown-sugar heroin smoking in the 1980s as a consequence of becoming a drug trafficking country. New legislation and stricter enforcement of drug policies controlled this epidemic in 1987 and 1988. This was followed by a temporary reduction in the supply of heroin, but an increase in the consumption of alcohol and licit psychoactive drugs. Since 1991, heroin again has been on the rise, with the predominant route of administration through injecting (Stimson 1996).

Drug enforcement policies that target specific substances also have had limited effectiveness and can result in increased use of other drugs. For example, in India, as a result of active vigilance by the Excise Department and enforcement of strict legal penalties on the heroin drug user population, there was a reduction in the supply of heroin and a corresponding increase in price. This brought about a decline in the number of exclusive heroin users, but these drug users instead switched to injecting synthetic opiates. While the injection of heroin decreased as a result of drug enforcement policies, overall injecting behaviour did not change (Pal et al 1990). This indicates that drug enforcement policies targeted at specific substances (such as opiates) may have the effect of decreasing use of that substance, but also have the effect of increasing use of other substances, resulting in no overall change in the extent of substance abuse.

Enforcement policies also influence drug trade routes. Prior to the 1980s there was very little use of opioid drugs or cocaine in West Africa. However, this area became an important trafficking route for cocaine from South America and heroin from Southeast Asia en route for Europe and North America. Law enforcement efforts in Nigeria against transport and travellers originating in Nigeria have helped cause a shift in drug trade routes to Côte d'Ivoire, Zambia, and Zimbabwe (Stimson 1993).

The policy of drug supply control has limited effectiveness in curtailing drug use. In fact, the final report issued by the WHO Multi-City Study group recommends that there needs to be a shift in commitment from law enforcement to strategies that focus on public health and social conditions in responding to the problem of drug injecting (WHO 1994).

Section Six: Conclusion

HIV can spread extremely rapidly among injecting drug users who share injecting equipment, and IDUs provide a 'bridge' for HIV transmission to their sexual partners and children. One approach has been to attempt to reduce drug use by strengthening drug interdiction and enforcement policies. However, such policies are not necessarily effective in controlling the drug supply, they may simply reroute drug trade elsewhere, and they may indirectly result in raising risky behaviour that spreads HIV.

The keys to reducing the rapid spread of HIV among injecting drug users are, first, recognition of injecting drug use as a potential problem, and second, early intervention that includes harm reduction as well as demand reduction strategies. The evidence shows that injecting drug users do change their risky injecting behaviour as a result of harm reduction programmes, and sometimes without large-scale intervention efforts. The two important components for harm reduction programmes are education and provision of the means with which to change behaviour. The latter may include sterile needles (either through needle exchange programmes or available in pharmacies without a prescription), bleach, and/or drug rehabilitation programmes. Interventions to prevent sexual transmission from IDUs to their partners through increased condom use have met with only limited success but are vital for preventing the spread of HIV out of the injecting group and into the general population.

Note

1 These figures represent the annual programme costs divided by the 'estimated drug-related and sex-related HIV infections averted among programme clients, their drug and sexual partners and their offspring, over five years' (Lurie et al 1993).

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The effectiveness of HIV prevention strategies under alternative scenarios: Evaluation with the STDSIM model

by Carina van Vliet, King K. Holmes, Burton Singer, and J. Dik F. Habbema

Section One: Introduction

1.1 Background and objective

In developing countries sexually transmitted diseases (STDs), including HIV infection, are a major cause of acute and chronic disease and of premature death. The spread of HIV and other, classic STDs results from a complex interaction among different factors related to demography, sexual behaviour, infection, and disease characteristics, as well as the availability, accessibility, and effectiveness of health care. This complexity makes it difficult to predict the effects of HIV prevention strategies.

An important question in the fight against HIV and other STDs is whether and to what extent prevention strategies should be focused on specific groups in the population who are at high risk of contracting and transmitting STDs (so-called core groups). Simplified modelling exercises suggest that interventions focused on core groups are more effective and more cost-effective than interventions focused on the general population (Over and Piot 1992, 1996). However, it is unclear whether this conclusion holds generally, because in practice the effectiveness of focusing interventions on high-risk groups depends among others on:

- the sexual behaviour pattern in a population,
- the stage of the HIV epidemic, and
- the ability to identify core groups and to reach them in practice.

In this paper we present a theoretical evaluation of the effectiveness of prevention strategies focused on different population groups. For this evaluation, predictions of the future spread of HIV and of four other classic STDs are made with the STDSIM simulation model for four hypothetical populations with different patterns of sexual behaviour. In our analysis we also address the relationship between the timing of interventions and the effectiveness of different prevention strategies. In our modelling exercise we do not focus on the important issue of the feasibility of identifying core groups, but instead simply assume that it is possible to reach and influence a certain proportion of them as well as of the general population.

1.2 Profiles of sexual behaviour

Sexual behaviour patterns vary widely between populations in different countries, as has been shown in sexual behaviour surveys performed by the WHO throughout the developing world (Caraël 1995). Moreover, large differences in sexual norms and practices may exist between different groups of the population within a country. In order to study how these differences in sexual behaviour patterns affect the relative effectiveness of prevention strategies, we explore the spread of HIV and other STDs under different combinations of assumptions on sexual behaviour. We call these combinations of assumptions on sexual behaviour a 'sexual behaviour profile'. We choose not to use country-specific data but to define stylised profiles, in order to distinguish more clearly sexual behaviour patterns and to explore the sensitivity of results to underlying assumptions of sexual behaviour.

We consider the following sexual behaviour profiles:

Profile 1

Women only have sex in steady relationships, except for a very small percentage of women who are sex workers (SWs). Men engage in commercial sex, sometimes also while they are in a steady relationship.

Profile 2

Women are monogamous while in a steady relationship; otherwise they may engage in possibly overlapping casual relationships. Men engage in both casual and commercial relationships, which can be concurrent with a steady relationship.

Profile 3

Both women and men can have multiple, concurrent casual relationships, which can be concurrent with a steady relationship. There is no commercial sex in this profile.

Profile 4

The main sexual behaviour pattern for both men and women is serial monogamy; that is, there is no overlap in noncommercial relationships. Commercial sex is only initiated by men who are not in a steady relationship. The rate of partner change is rather high, especially in adolescents and young adults.

The differences between these profiles are qualitatively described in table 1. Note that fewer than 0.3 per cent of women are sex workers in Profiles 1, 2, and 4 and may have other relationships, including steady ones. There is no commercial sex in Profile 3.

Table 1. Qualitative description of sexual behaviour profiles

	Casual relationships		Commercial contacts
Profile	Men	Women	Men
1	None	None	At any time
2	At any time	Only while not in a steady relationship	At any time
3	At any time	At any time	None
4[a]	Only while not in a steady relationship	Only while not in a steady relationship	Only while not in a steady relationship

a. All casual relationships in Profile 4 are serial monogamous.

1.3 Prevention strategies

Many strategies could conceivably prevent the spread of HIV and other STDs, including general education and information campaigns for behaviour change, special condom use programmes, and programmes to improve health care accessibility and the effectiveness of STD treatment. Prevention strategies do not only differ in the kind of behaviour they address, but also in the population on which they focus. Programmes directed at the general population will have a totally different outline and effectiveness than programmes directed at high-risk groups, like sex workers.

We compare the effects of five prevention strategies that involve increased condom use or improved detection and/or treatment of classic STDs, focused on three different groups of the population – sex workers, men who engage in commercial and casual sex, and the general population.

Prevention strategies that reduce the number of sexual partners or delay the onset of sexual activity have not been modelled. Furthermore, we assume no other spontaneous changes in condom use, STD treatment, or the number of partners in the population. However, we do allow for the possibility that HIV raises the mortality of people with the highest sexual activity, which can change the pattern of sexual behaviour in a given population, even without a specific intervention.

1.4 Outline

The structure of the STDSIM model and some of its main assumptions are described in section 2. Section 3 describes the assumptions behind the four sexual behaviour profiles. In section 4 we show baseline projections of HIV prevalence under the four profiles. In section 5 we describe the assumptions for the five prevention strategies, show projections of HIV prevalence when they are implemented, and assess the sensitivity of the results to assumptions about compliance with and the timing of interventions. The sixth section compares the average number of HIV and STD infections averted per unit of programme output (condoms or STD treatment used) across the prevention strategies and sexual behaviour profiles. We conclude the paper with a general discussion.

Section Two: The STDSIM model

2.1 Introduction

The STDSIM model describes the transmission, consequences, and intervention possibilities for HIV and four 'classic' STDs: gonorrhoea, chlamydia, syphilis, and chancroid. We assess alternative prevention strategies by calculating and comparing their health effects and programme outputs. The integration of HIV/AIDS and other STDs into a single model is important, because of the evidence that HIV transmission is facilitated if one of the partners suffers from other STDs (Wasserheit 1992). STDSIM is designed to describe the spread of HIV and other STDs in different settings with respect to demography, sexual behaviour, health care, and intervention. In this paper, we concentrate on transmission by heterosexual contact. Transmission from mother to child is also taken into account. We do not consider homosexual transmission or transmission by blood transfusions or unsterile needles.

2.2 Modelling technique: Microsimulation

STDSIM is a microsimulation model. Life histories of hypothetical individuals are simulated over time by means of a computer program. Each individual is represented in the computer by a number of characteristics, some of which remain constant (e.g., sex and date of birth), while others change during the simulation (e.g., infection and disease status, number of sexual partners). Changes in characteristics are the result of events that occur during the life of the simulated individuals, like starting and ending sexual relationships, acquiring sexually transmitted infections, and seeking their cure. Most of the events are stochastic: probability distributions determine if and when an event occurs. To generate model outcomes for a simulated population, the life histories of the simulated individuals are aggregated.

In STDSIM, sexual relationships between men and women are explicitly modelled. For example, when a simulated person becomes infected with an STD, his/her uninfected partner(s) may also become infected. Relationships also have certain characteristics, such as frequency of intercourse and duration.

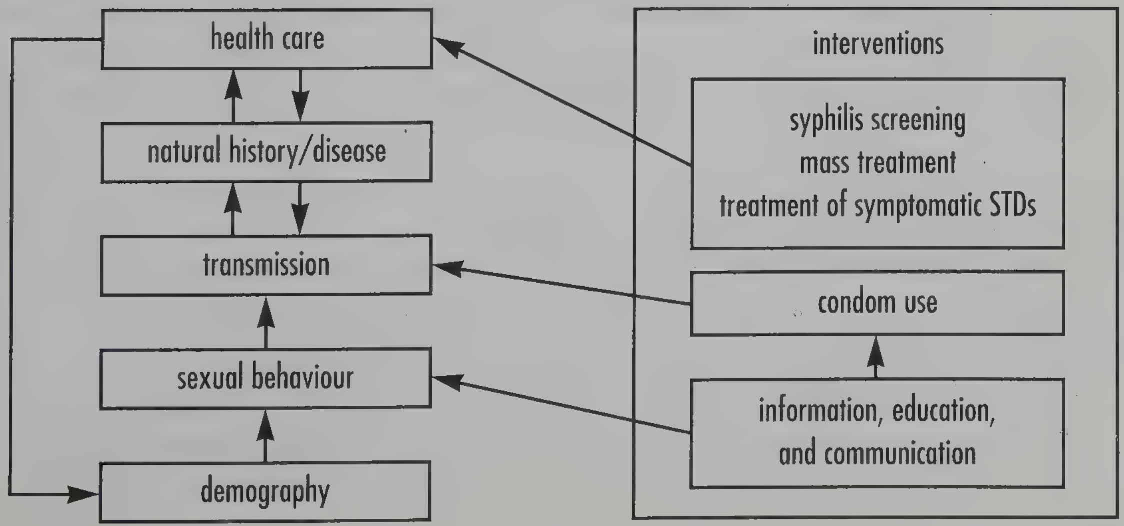
Experience with the development and actual application of models for cancer screening (Habbema and others 1984) and river blindness control (Goodman 1994; Habbema and others 1992, 1996) has shown that microsimulation accounts well for complex interactions among a variety of factors affecting the effectiveness of interventions.

2.3 Overview of the STDSIM model

Factors affecting the transmission of STDs are grouped into modules in the STDSIM model (figure 1). These modules include: demography, sexual behaviour, STD transmission, natural history, the health system, and interventions. These modules and the most important quantitative assumptions in each of them are discussed briefly below. The four populations that we compare using STDSIM only differ with regard to sexual behaviour, while the assumptions for demography and STD transmission are identical. A copy of the input file for Profile 2 is in Appendix 1. The differences in assumptions on sexual behaviour between this and the other profiles are explained in Appendix 2.

- The demography module describes the processes of birth, death, and migration. Together, the demographic processes determine the size and sex and age composition of the (open) model population. The number of births depends on age-specific fertility figures and on the number of fertile women in different age classes. A total fertility rate of 3.6 was assumed, corresponding with the average total fertility rate in the developing world (UNICEF 1995). In order to model mortality, we use Coale and Demeney-West survival probabilities with a mean life expectancy of 62.5 for females and the accompanying survival probabilities for males (Coale and Demeney 1966). In some individuals death is advanced due to HIV infection, leading to a lower actual life expectancy than specified in the indicated life table. For this exercise, we do not consider immigration and emigration.
- The sexual behaviour module describes the initiation and dissolution of sexual relationships between individuals. These relationships form a dynamic network through which STDs can be transmitted. Commercial sex is explicitly taken into account. In noncommercial relationships a distinction is made between steady relationships, which commonly last

Figure 1. Overview of the modules of the STDSIM model



until the death of one of the partners, and casual relationships with an average duration of 0.2 years. It can be specified to what extent relationships can overlap, that is, concurrency (Morris and others 1995). Partner selection takes place on the basis of age preference, with a tendency in males to choose female partners of a somewhat younger age. The frequency of sexual contacts within relationships is assumed to be 1.5 per week on average. Heterogeneity in sexual behaviour is incorporated in two different ways. Discrete groups of male clients are specified according to the frequency with which they engage in commercial sex. The inclination to engage in commercial sex is a personal characteristic of men and can vary with their relationship status. In all profiles, we assume that, of the men who engage in commercial sex, half have sex with sex workers once a year and the other half six times a year. For noncommercial relationships, individuals differ in their tendency to initiate new (casual or steady) relationships depending on their age, personal inclination, and whether they already have other sexual relationships. The personal inclination to initiate new relationships can vary through a continuous spectrum, from not at all to very much. But for the age-specific indicators, discrete groups are assumed. Commercial sex is assumed to be entirely demand driven. Female SWs are recruited in order to fulfill the demand for commercial sex, in such a way that SWs have on average 10 clients a week.

- In the transmission module, transmission probabilities per sexual contact are specified for HIV and each of the four other STDs. For HIV the risk of transmission is assumed to be 0.5 per cent contact from male to female and 0.25 per cent from female to male. The enhancing effect of infection with other STDs on susceptibility and infectivity of HIV is taken into account, with a factor of 5 for chlamydia and gonorrhoea and a factor of 25 for chancroid and the first phase of syphilis infection. Variations in infectivity during the course of HIV infection and the role of circumcision in transmitting HIV or other STDs are not taken into account. The transmission rate of HIV from an HIV-positive mother to her newborn child is assumed to be 40 per cent. Incidental sexual contacts with infected persons from outside the simulated population can cause additional STD infections. Therefore, for each STD a yearly incidence is specified, with infections randomly attributed to the sexually active population.
- The natural history/disease module specifies the duration of infectiousness. An average duration of HIV infection of six years for adults and of two years for infants is assumed. For the four classic STDs the fraction of infected persons remaining asymptomatic throughout their infection is specified. Asymptomatic persons will not seek STD-related health care and consequently will not get cured. Hence, asymptomatic persons will continue transmitting the STD until infectiousness is lost spontaneously.

- The health system module describes the effect of medical treatment in terms of:
  - the per cent of symptomatic infected individuals who get cured, which is assumed to be 25 per cent at baseline, and
  - the duration of infectiousness for cases that receive effective health care.
- Finally, in the interventions module the timing and effectiveness of control measures are specified. For condom use programs, it is assumed that individuals use condoms consistently, with a probability of condom failure of 5 per cent per act of intercourse. The baseline level of consistent condom use is 20 per cent among SWs and 5 per cent among men in all casual relationships and commercial contacts. If either or both an SW and her client wish to use a condom, it is assumed that a condom is used. For example, at baseline the probability of condom use in commercial sex is 0.24, or 0.20 plus (0.80 x 0.05). Furthermore, we initially assume that no condoms are used in steady relationships. We assume that at baseline no SWs participate in special STD screening and treatment programs.

Section Three: Assumptions on sexual behaviour

The assumptions on sexual behaviour induce a process of partnership formation and dissolution, a dynamic network of sexual relationships. For each simulated individual in the model, numbers of partners within specific time periods can be counted. Figure 2 shows age- and sex-specific numbers of partners during one year for the four different profiles before HIV is introduced. Selective mortality of those with the most partners can alter these baseline patterns of sexual behaviour after HIV is introduced.

Profile 1

The number of sex partners is strongly asymmetric between men and women. Except for those engaged in commercial sex, women only have sex in steady relationships. All single men and 40 per cent of married men engage in commercial sex. A high percentage of men aged 15–19 has had no recent sexual partner because many have not initiated sexual activity. However, almost all men aged 20–24 have initiated sexual activity, but only half are in a steady relationship, implying relatively high rates of visiting SWs and a large number of recent partners.

Profile 2

Men and women who are not in a steady relationship engage in possibly overlapping casual relationships. The level of concurrency is low in persons aged 15–24 – about 5 per cent of men and women have concurrent relationships at a given time – but a sequence of casual relationships can lead to relatively high numbers of persons having more than one relationship in a year. At older ages, most women are in monogamous steady relationships, as evidenced by a majority having only one recent partner. In contrast, as they age, men in steady relationships continue to engage in commercial and casual relationships. This results in continued high numbers of partners.

Profile 3

Men's and women's sexual behaviour is relatively symmetric: both men and women can have multiple, concurrent relationships, including while engaged in a steady relationship. Full symmetry does not occur due to the tendency in men to start relationships with younger women. Despite the absence of commercial sex, the number of persons with more than one partner in the last year is relatively high due to concurrent relationships.

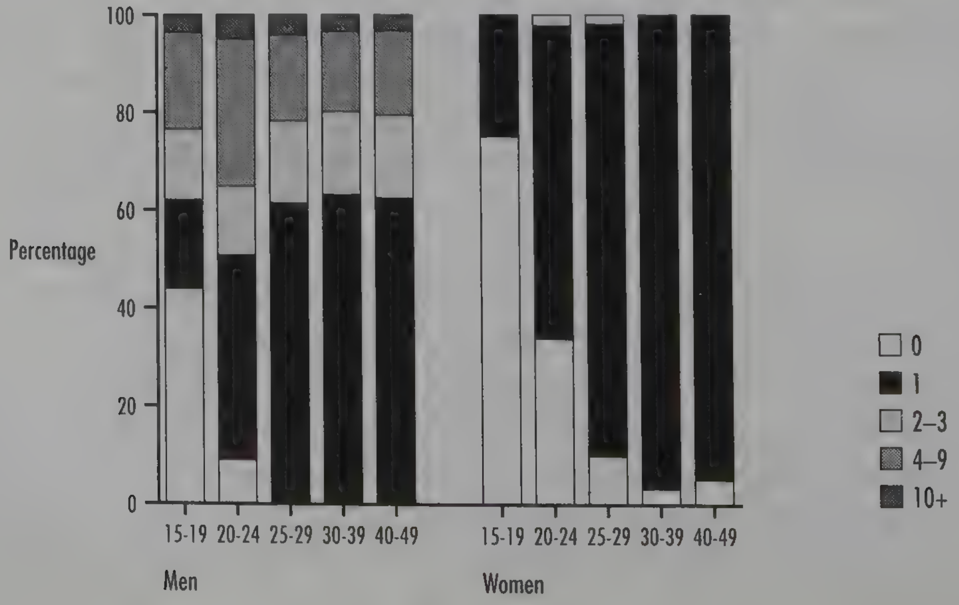
Profile 4

All people are monogamous, apart from men who engage in commercial sex when in a casual relationship. Among adolescents, a new relationship is started almost immediately after terminating a previous one. Consequently, the number of recent partners is high for persons who have initiated sexual activity but are not yet in a steady relationship, while most persons in steady relationships have only one recent partner. Commercial sex is only practised by men who are not in a steady relationship. Hence, older adults, who are often in a steady relationship, have one recent partner.

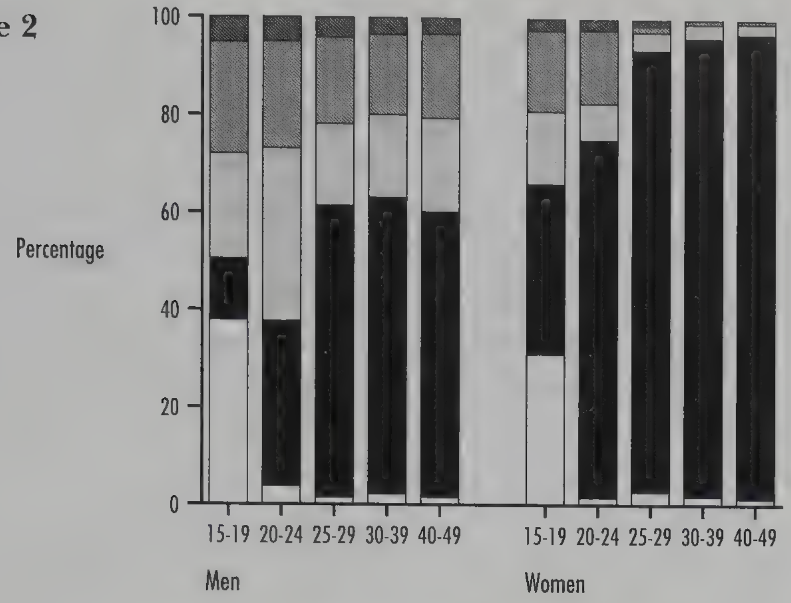
The per cent of women aged 15–49 who engage in commercial sex at a given moment varies across the different profiles, according to the demand for commercial sex. It is highest in Profile 1, at approximately 0.30 per cent of women; followed by Profile 2, with approximately 0.20 per cent; and it is lowest in Profile 4, at 0.05 per cent. In Profile 3, by definition, no commercial sex takes place.

Figure 2. Age- and sex-specific distribution of the number of sexual partners in the past year for four sexual behaviour profiles

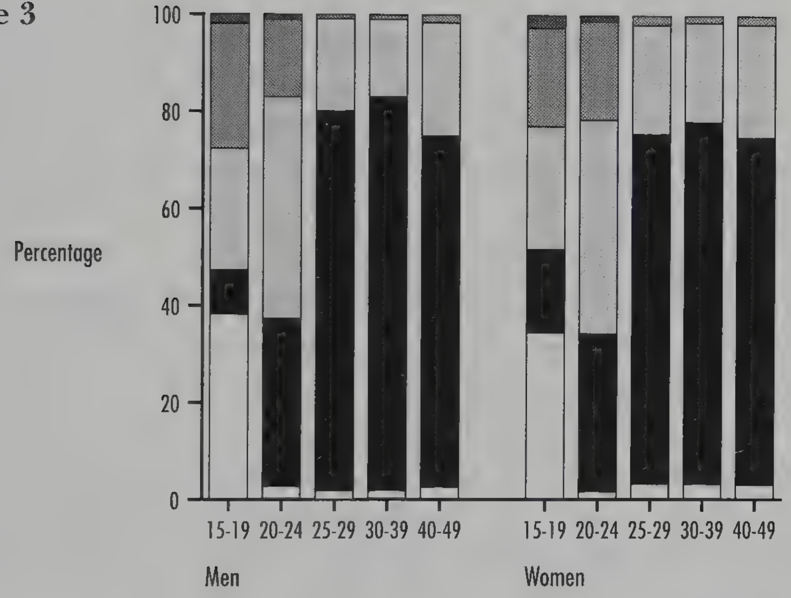
Profile 1



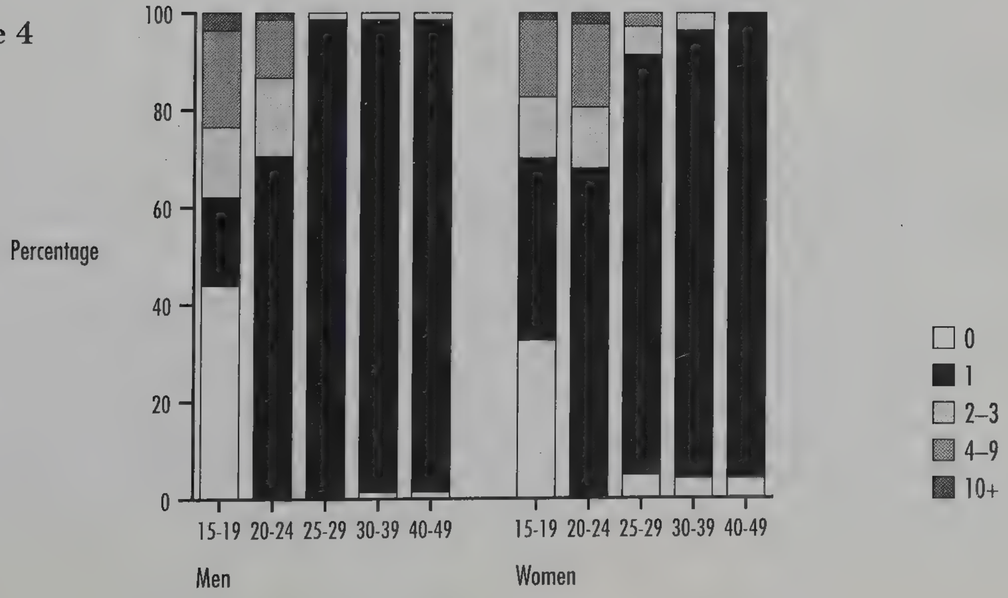
Profile 2



Profile 3



Profile 4



Section Four: Baseline results

4.1 HIV prevalence

Figure 3 shows the simulated development of the HIV epidemic over time for the four profiles. HIV is introduced in year zero and the simulation runs for 30 years. HIV is introduced by randomly assigning an infection to an SW (Profiles 1, 2, and 4) or to 10 sexually active persons (Profile 3). In order to reduce the stochastic fluctuations in simulation outcomes, for each profile we have averaged the results of 20 runs for a population of approximately 20,000 hypothetical individuals. It is clear that different profiles on sexual behaviour induce completely different courses of the HIV epidemic.

Profile 1

The HIV epidemic evolves rapidly because of the pivotal role of commercial sex in its spread. HIV prevalence starts declining after year 8 for males and after year 10 for females. This is because risk behaviour is very much concentrated in men engaging in commercial sex. These men are likely to contract HIV relatively early in the epidemic and to die of this disease after a period of 6 years (the assumed duration of HIV infection). This process of selective death reduces the percentage of men that engage in commercial sex, since SW visiting is modelled as a personal characteristic. Around year 20 an equilibrium is established, in which the inflow of young men at risk is counterbalanced by the outflow of persons due to HIV-related death. The process of selective death concomitantly leads to a decrease in the prevalence of other STDs (not shown), which in turn reduces HIV transmission through the cofactor effect.

HIV prevalence is higher in men than in women. This is because in almost all cases men get infected with HIV through commercial sex, and it takes a while before they transmit the infection to their female partners. Young single males infected with HIV may die of AIDS before engaging in a steady relationship and 'having the opportunity' to transmit the infection to women in the general population.

Profile 2

The HIV epidemic evolves rapidly to 17 per cent in year 8, after which it continues to increase at a slower pace. In the beginning of the epidemic HIV prevalence levels are higher in men than in women. However, 10 years after the introduction of HIV, women are the majority of HIV seropositives, although the difference in HIV seropositivity between men and women remains small. In the beginning of the epidemic most infections in men occur due to commercial sex (SWs are much more likely to be infected than women not engaging in commercial sex) and HIV transmission to female partners lags. In later stages of the epidemic noncommercial casual relationships are responsible for a large part of HIV infection. In these relationships more women than men become infected with HIV because the risk of transmission from men to women is assumed to be twice the risk of transmission from women to men.

Profile 3

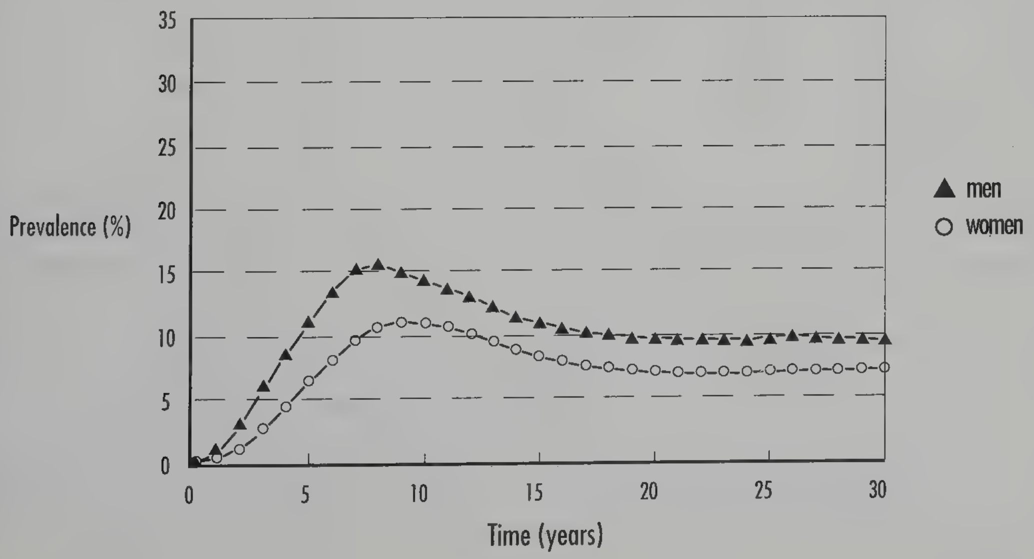
The HIV epidemic evolves very slowly, since there is no commercial sex to accelerate the epidemic. However, HIV prevalence and incidence grow steadily to more than 30 per cent HIV prevalence at the end of the simulation period, due to the high level of concurrency. From the beginning of the epidemic onwards, HIV prevalence levels are somewhat higher in women than in men. Men and women have similar numbers of partners, leading to a similar frequency of exposure to potential infection. However, as the risk of transmission from men to women is assumed to be twice the risk of transmission from women to men, exposure more often leads to HIV infection in women.

Profile 4

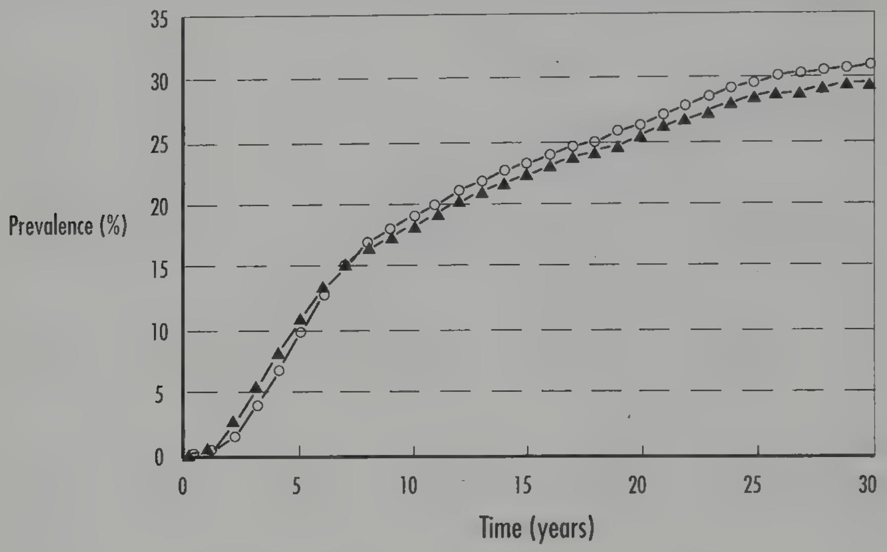
The HIV epidemic evolves slowly to reach a prevalence level of 9 per cent in year 30. Still, in the initial phase of the epidemic HIV spreads more rapidly in Profile 4 than in Profile 3 because commercial sex is present in the former. The absence of concurrent noncommercial relationships in Profile 4 results in a relatively low HIV prevalence in the longer run. In the first few years of the epidemic HIV prevalence levels are slightly higher in men than in women. However, six years after the start of the epidemic most HIV seropositives are female, although the difference by gender remains small. The reasons for this are the same as in Profile 2.

Figure 3. Baseline HIV prevalence by gender and sexual behaviour profile

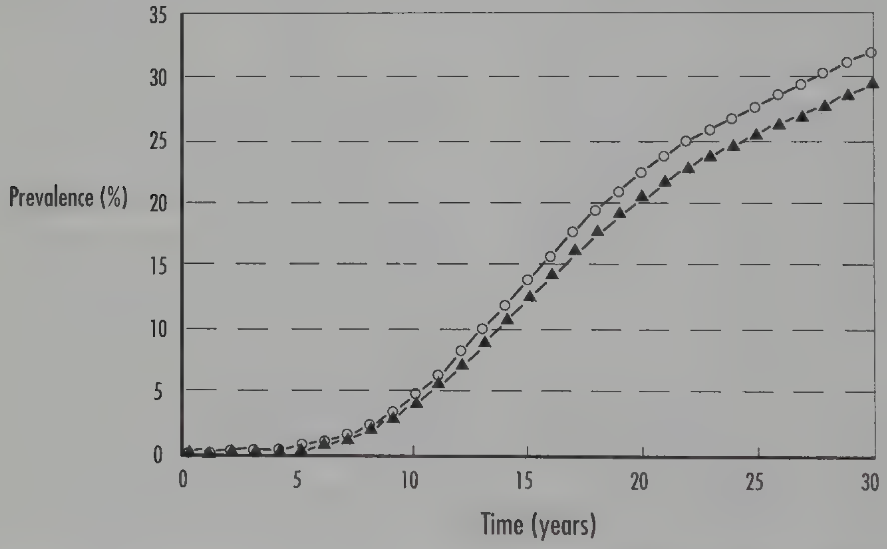
Profile 1: Baseline – HIV prevalence in men and women aged 15–49



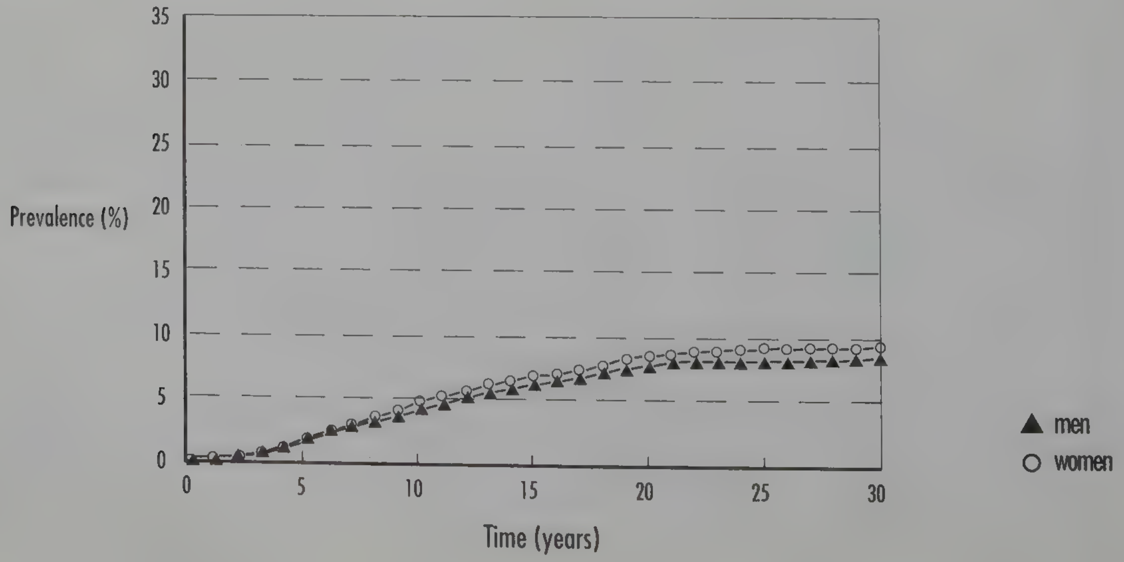
Profile 2: Baseline – HIV prevalence in men and women aged 15–49



Profile 3: Baseline – HIV prevalence in men and women aged 15–49



Profile 4: Baseline – HIV prevalence in men and women aged 15–49



Differences across the four profiles

The trend in incidence during the epidemic is determined by a balance between:

1. the increase in the number of infected persons, which increases the risk of new infections, and
2. the decrease in the number of susceptibles, which decreases the risk of new infections.

In settings in which risk behaviour is dispersed over the population, like in Profile 3, the first effect predominates: when HIV prevalence increases in the general population this induces an increase in HIV incidence. The second effect is relatively small, as many persons engage in behaviour that puts them to some extent at risk for HIV. Moreover, when risk behaviour is concentrated in adolescents and young adults, the group of susceptibles is constantly renewed with persons initiating sexual activity. Hence, HIV prevalence continues to increase to high levels in such settings. However, in settings in which risk behaviour is concentrated in core groups, like in Profile 1, the first effect is relatively small. A large part of HIV transmission is related to commercial sex. Therefore, an increase in HIV prevalence in the general population has limited impact on HIV incidence. In such profiles the second effect plays a major role, once the epidemic has taken off. This may result in HIV prevalence initially rising steeply and then falling very fast.

Section Five: Prevention strategies

5.1 Prevention strategies considered

We simulate the impact of three strategies to encourage condom use in different groups of the population and two strategies to improve STD treatment. For each type of prevention strategy, assumptions are made on the per cent of persons who respond. The assumptions on the impact of the strategies might be rather optimistic in some real world settings and relate to a best-case scenario:

- Sex worker condom-use strategy: the per cent of SWs who consistently use condoms in their commercial contacts increases from 20 per cent to 90 per cent.
- Male condom-use strategy: the per cent of men who consistently use condoms in casual and commercial contacts increases from 5 per cent to 20 per cent.
- Family planning condom-use strategy: the per cent of women under 50 who consistently use condoms in steady relationships increases from 0 per cent to 20 per cent.
- Sex worker STD-treatment strategy: the per cent of SWs who receive monthly STD screening and treatment increases from 0 per cent to 90 per cent.
- General population STD-treatment strategy: the per cent of symptomatic STD episodes cured increases from 25 per cent to 75 per cent.

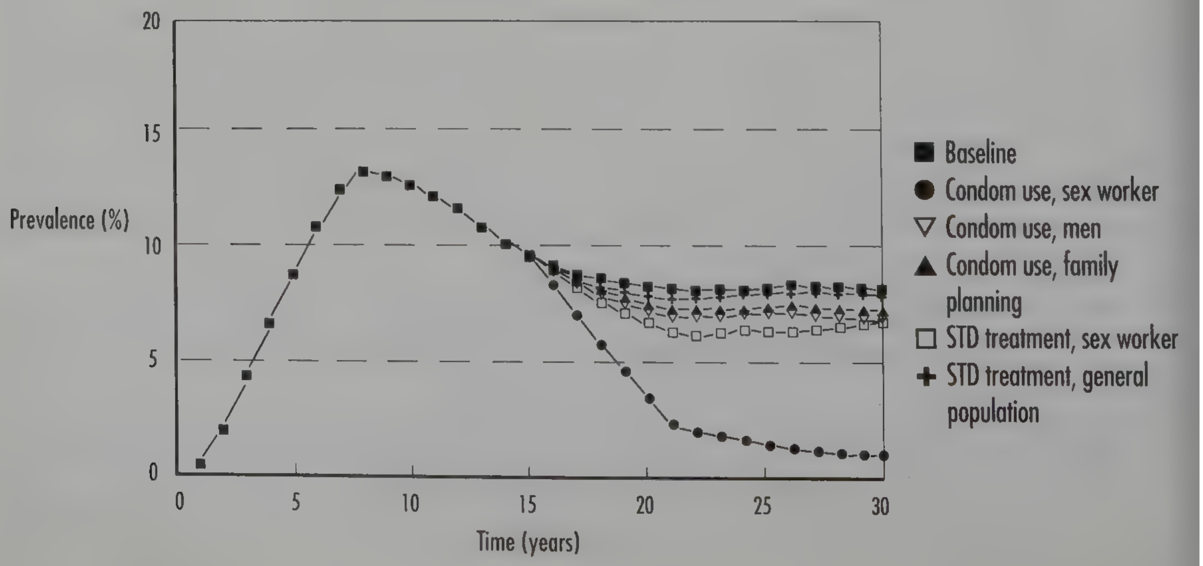
We assume that among those who use condoms, the failure rate through breakage or incorrect use is 5 per cent, implying that the other 95 per cent of contacts are adequately protected against transmission of HIV and classic STDs. Furthermore, we assume that 95 per cent of the infected SWs participating in the STD-treatment strategy are cured. In practice, such a high cure rate might only be achieved by applying mass treatment, as STD diagnosis is difficult and may leave a considerable number of (especially asymptomatic) cases undetected at screening. In neither STD-treatment strategy do we assume that partners are referred for treatment or that condom use changes due to counselling. We show simulations of the impact of these prevention strategies when introduced in year 15 of the HIV epidemic and we assume that the strategies lead to sustained changes until the end of the simulation period.

5.2 Results

Figure 4 shows the simulated impact of increased condom use and improved STD treatment on HIV prevalence in the four sexual behaviour profiles considered. The prevention strategies directed at SWs are not relevant to Profile 3 and thus are not shown. The strategy of 90 per cent condom use among SWs is the most effective strategy in the three profiles that include commercial sex (Profiles 1, 2, and 4). In Profile 1, in which commercial sex is the only type of sex outside of steady relationships, this strategy reduces HIV prevalence to very low levels.

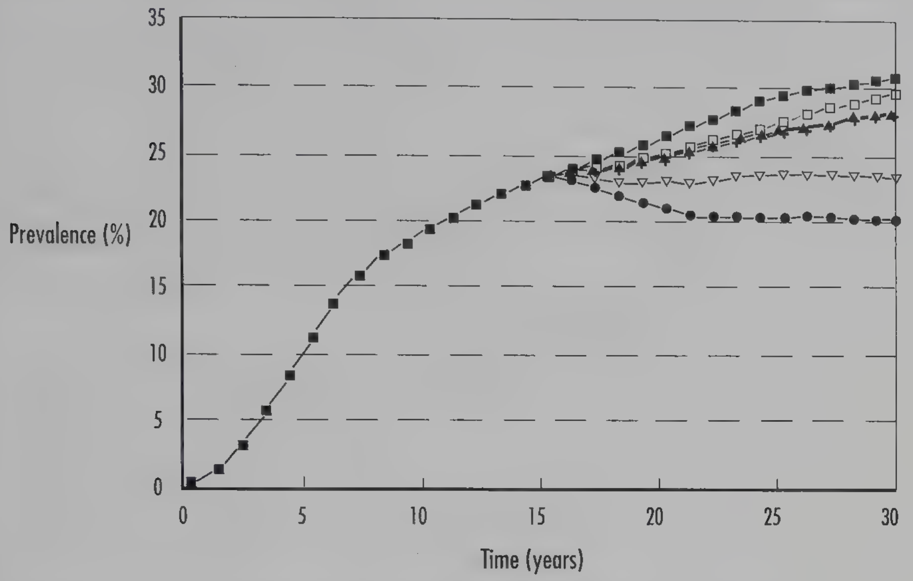
The increase in condom use to 20 per cent among women in steady relationships has a minor effect in all four profiles. The effect is smallest in Profile 4, which assumes serial monogamy in noncommercial relationships. With serial monogamy, condom use in steady relationships prevents HIV

Figure 4. The impact of five prevention strategies on HIV prevalence, by sexual behaviour profile

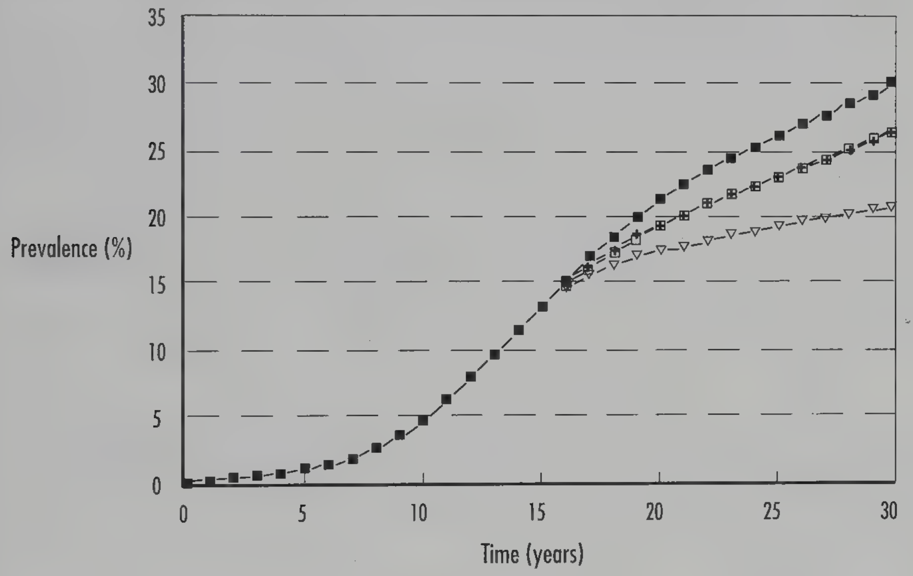


Profile 1: Interventions – HIV prevalence for population aged 15–49

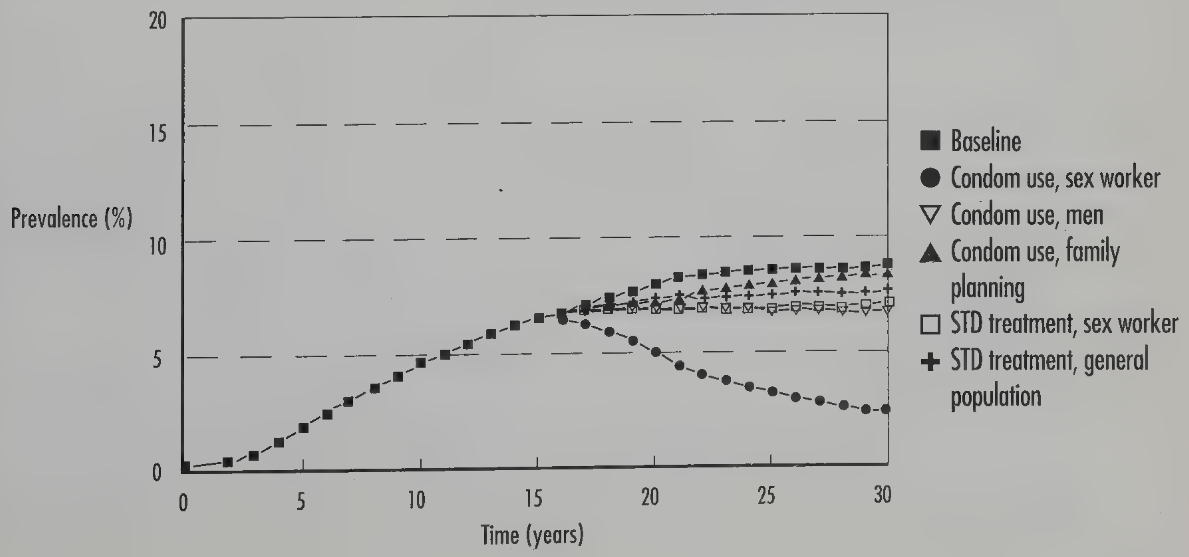
Profile 2: Interventions – HIV prevalence for population aged 15–49



Profile 3: Interventions – HIV prevalence for population aged 15–49



Profile 4: Interventions – HIV prevalence for population aged 15–49



transmission within only one relationship at a time. However, in Profile 3 the impact of this strategy is relatively large because condom use in a steady relationship has spillover effects to other concurrent relationships.

In all four profiles, the effectiveness of increasing condom use in casual and commercial contacts of men from 5 per cent to 20 per cent lies between the effectiveness of the other two condom-use strategies. However, in Profile 1 the impact of the male condom-use strategy is only slightly larger than the impact of the family planning condom-use strategy, while in Profiles 2, 3, and 4 the male strategy has a much larger impact.

Increased condom use affects HIV transmission both directly and indirectly. Use of condoms will directly prevent HIV transmission to a large extent, but in all profiles it also reduces the transmission and the prevalence of the four other STDs. Through the effect of classic STDs in raising rates of HIV transmission, the reduction in STD prevalence lowers HIV transmission further.

For all four profiles, our simulations show relatively small effects of the general population STD-treatment strategy. This finding can be related to several assumptions. In the first place, we assume high proportions of asymptomatic STD infection (especially for gonorrhoea and chlamydia) in both men and women. Thus, even with highly effective STD treatment, only some of the infected cases will be treated. Secondly, we assume that treatment is not accompanied by partner referral and/or condom promotion. This allows rapid STD reinfection, as it is assumed that persons are again susceptible to infection immediately after their STD is cured.

The effect of regular SW screening and treatment differs between the three profiles in which this strategy is applicable. In Profiles 1 and 4 this strategy is more effective than STD treatment in the general population, but it is not in Profile 2. An explanation is that in Profiles 1 and 4, the vast majority of the STD load is directly or indirectly linked to commercial sex, while this is less the case in Profile 2.

5.3 Isocurves: Varying compliance with prevention strategies

The simulated impact of the five prevention strategies depends to a large extent on the success of each strategy in changing the behaviour of the target population. If we were to assume, for instance, that condom use among sex workers increases from 20 per cent to 30 per cent (instead of 90 per cent) then the effect of this strategy would be much lower. Also, it is conceivable that combinations of the strategies are even more effective than isolated strategies that have been considered above.

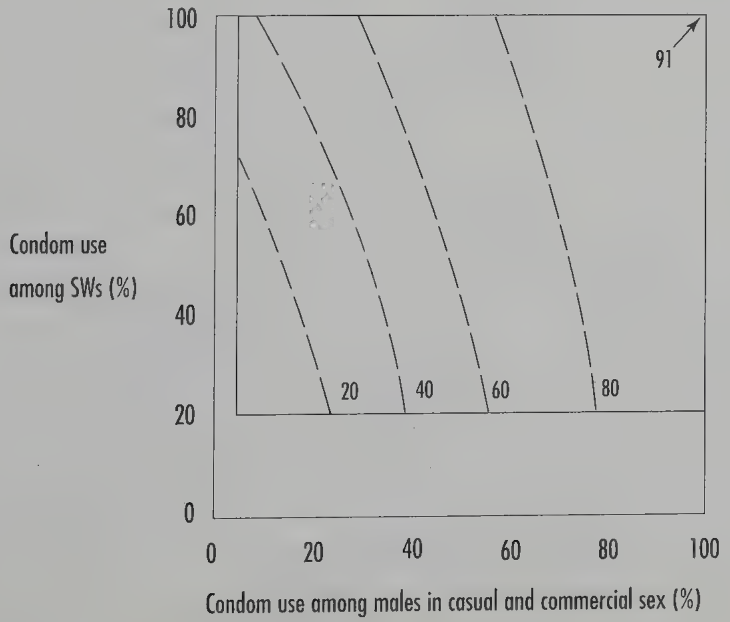
To illustrate the effect of varying the compliance with prevention strategies and of combining different prevention strategies, we have calculated an HIV incidence isocurve for Profile 2 (figure 5). This isocurve shows the reductions in average HIV incidence resulting from different combinations of condom use among SWs and among men in casual and commercial contacts, relative to the baseline assumption of 20 per cent condom use among SWs and 5 per cent among men engaging in commercial and casual sex. For example, the same reduction in HIV incidence of 20 per cent can be obtained by an increase in consistent condom use in casual and commercial contacts of men to 25 per cent, by an increase in consistent condom use among SWs to 72 per cent, or by a combination of an increase in condom use among SWs to 40 per cent and an increase in condom use among men to 15 per cent.

The maximum reduction in HIV incidence is 91 per cent, when 100 per cent of SWs use condoms in their commercial contacts and 100 per cent of men use condoms in all their casual and commercial contacts. Not all HIV transmission is stopped because of condom failure and transmission within steady relationships.

Figure 5 shows that in Profile 2 a given percentage increase in condom use among SWs has a smaller relative effect on incidence than an equal increase in condom use among men in the general population. For instance, an increase of condom use among SWs from 20 per cent to 70 per cent reduces HIV incidence by 20 per cent, while an increase in condom use among men from 5 per cent to 55 per cent reduces HIV incidence by 60 per cent. However, it must also be kept in mind that SWs represent less than one-third of 1 per cent of adult women, while men represent roughly half of all adults. Thus, the absolute number of people whose behaviour must change is much larger in the second instance.

Similar isocurves could be drawn for other profiles and other combinations of interventions. The additional benefits of combining prevention strategies depend on the pattern of sexual behaviour and the type and coverage levels of

Figure 5. Isocurves: the per cent reduction in HIV incidence associated with levels of condom use among sex workers and men in casual and commercial sex, Profile 2



the prevention strategy. Both synergy effects, which raise the effect of the combined strategy above the sum of each individual strategy, and saturation effects, which reduce the effect of the combined strategies below the sum of each individual strategy, can occur.

5.4 Timing of prevention strategies

In the previous sections we assumed that prevention strategies are initiated 15 years after the start of the HIV epidemic. Intervening earlier would prevent many more cases of HIV infection.

Figure 6 shows the impact of the three condom-use strategies on HIV prevalence when introduced three years after the start of the epidemic in Profile 2. Comparing these results with those in figure 4, early interventions clearly have a larger impact than do late interventions. This is especially true for the SW condom-use strategy. Reaching 90 per cent condom use among SWs from year 3 onwards results in an HIV prevalence at the end of the simulation period of 13 per cent, compared with 19 per cent prevalence if the same level of condom use is reached in year 15. For this strategy, intervening early is 3.2 times better than intervening late in terms of the number of HIV cases prevented during the simlation period.

For the condom-use strategies focusing in the other two groups it is also beneficial to intervene early. Although for these strategies the difference in HIV prevalence at the end of the simulation between figures 4 and 6 is relatively small, benefits take place over a longer time period. The surface area between the baseline and the intervention curves indicates the effect of the intervention. This area is in all cases larger when intervening early. Over the

Figure 6. The impact of early condom interventions in Profile 2

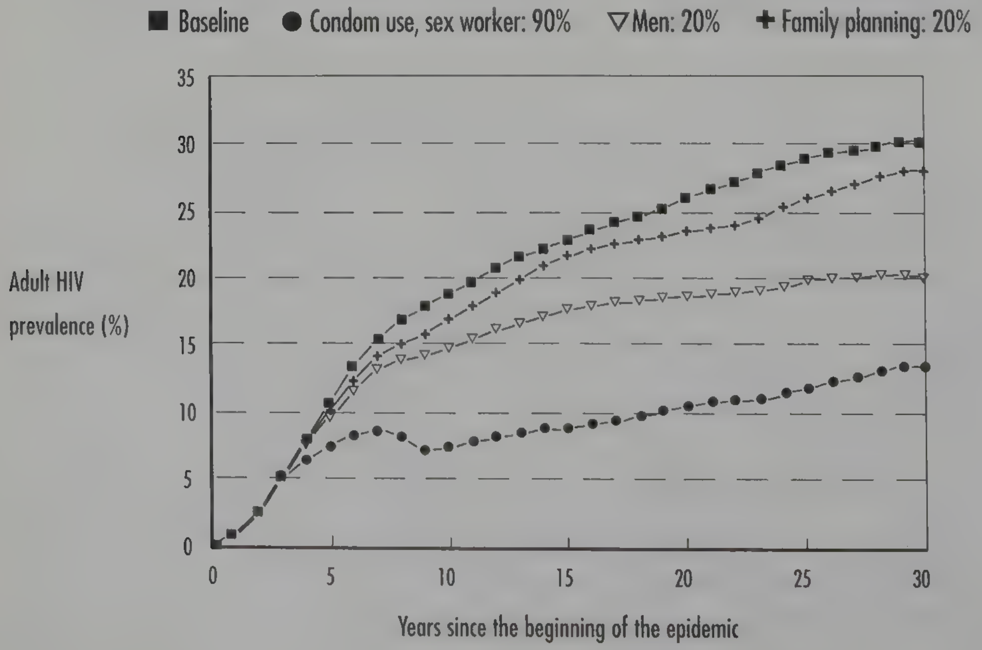
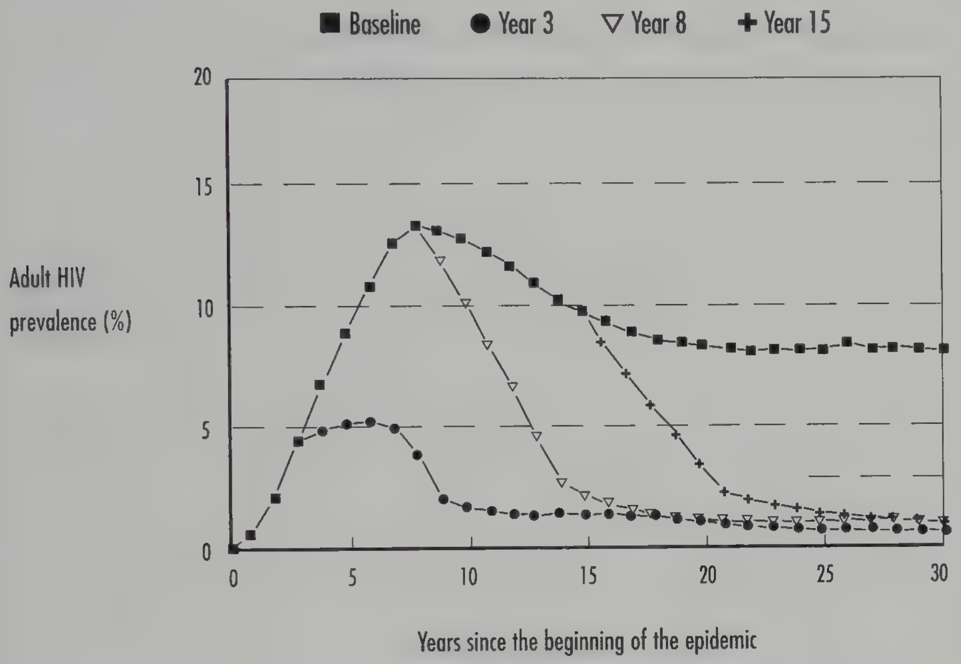
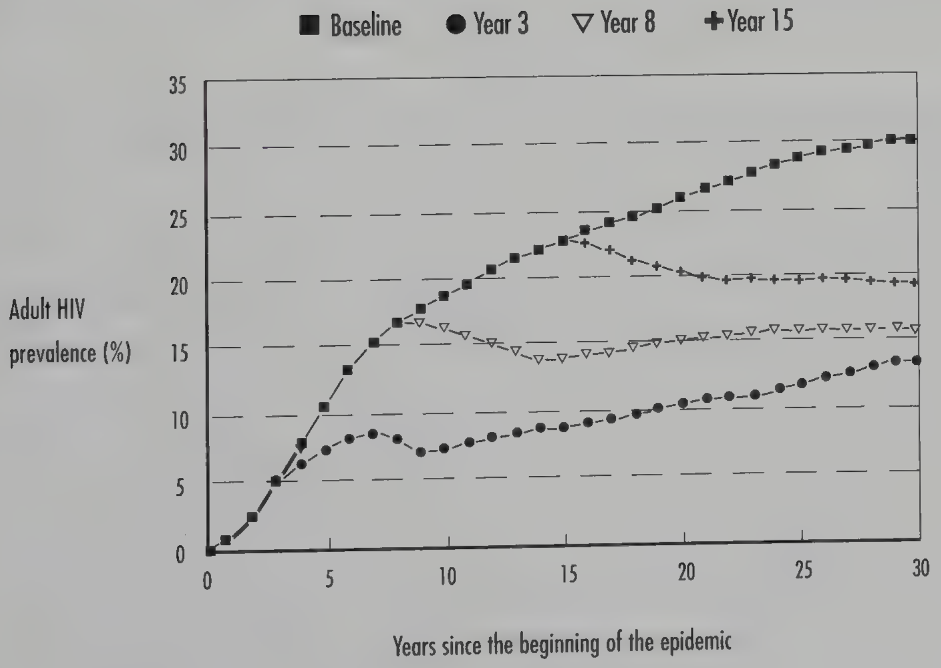


Figure 7. Impact of the timing of the SW condom-use strategy on HIV prevalence, Profiles 1 and 2

7a: Profile 1



7b: Profile 2



simulation period, 2.1 times as many HIV cases are averted when the increase in condom use in casual and commercial sex starts in year 3 instead of in year 15. Even for the family planning condom-use strategy, early intervention increased the number of HIV cases averted by 50 per cent.

The length of the simulation period affects the estimate of the number of additional HIV cases prevented when intervening early: the longer the simulation period, the smaller the difference, since sustained interventions converge to the same prevalence irrespective of the start time. Furthermore, the length of time between the early and late intervention becomes relatively smaller when considering a longer simulation period.

Figure 7 shows the results of different timing of increased condom use among SWs for Profiles 1 and 2. HIV prevalence eventually stabilises at the same level, which is lower than the baseline, regardless of the timing of the intervention. The same holds true for Profile 4 (not shown). Many more infections are prevented and peak prevalence is lower when intervention is early.

There are some qualitative differences in the results on timing across profiles, however. In Profile 1, early increases in condom use among SWs reduce HIV absolutely and dramatically relative to previous levels. The same is true for Profile 4 (not shown). In contrast, in Profile 2 this strategy reduces HIV prevalence considerably throughout the whole simulation period compared to the baseline, but it reduces HIV prevalence relative to previous levels only when the intervention comes in year 15.

Calculation of the number of HIV cases prevented during the simulation period indicates that the relative effectiveness of intervening early is of the same order of magnitude for Profiles 1 and 4, while for Profile 2 relatively more HIV cases can be prevented by early action.

Section Six: Effectiveness of prevention strategies in relation to programme outputs

6.1 Methodology

The effectiveness of prevention strategies per unit of effective programme output is calculated as the difference in terms of health effects (number of HIV and STD infections prevented) and effective programme outputs (number of condoms, treatments, and SW screenings used) between simulations with and without a specific prevention strategy for each year of the simulation. In these simulations, the number of condoms distributed and the number used are assumed to be the same. That is, there is no 'wastage'. These yearly differences are added over an evaluation horizon of 10 years, applying a discount factor of 3 per cent. The cumulative health benefits are then divided by the cumulative incremental effective programme outputs to come up with an average effectiveness per 1,000 condoms, STD treatments, or SW screenings. In this exercise, we do not allow for the fact that programme outputs may have some effects behind the evaluation horizon. However, because most effects occur already during the evaluation horizon, our results are relatively insensitive to the length of the evaluation horizon and to the discount rate. We do not consider the cost of achieving a given level of programme output (e.g., 1,000 condoms used); it may be more costly to achieve condom use among some groups in the population than among others and these costs are likely to vary with the scale of the intervention.

6.2 Results

Table 2 summarises the simulated average effectiveness per unit of programme output, discounted to year 15, of the five prevention strategies for the four profiles of sexual behaviour, when the strategies are initiated in year 15.

The average number of HIV infections averted per 1,000 condoms used is low for the family planning strategy in comparison with the other two condom-use strategies. This result is consistent with the low effectiveness of increased condom use in steady relationships shown in figure 4. Consistent condom use in steady relationships requires many condoms and it protects contacts of relatively low risk.

For Profiles 2 and 4, the average effectiveness per 1,000 condoms used is higher for the SW condom-use strategy than for the male condom-use strategy. In the latter, condoms are used in both commercial contacts and in casual relationships, but a condom used in a casual contact prevents fewer HIV cases than one used in a commercial contact.

This finding contrasts with the outcomes for Profile 1, in which condoms used in the male strategy are in fact exclusively used in commercial sex. The lower effectiveness per unit of programme output of the SW condom-use strategy can be attributed to differences in coverage of the respective strategies. High levels of condom use in commercial contacts reduce HIV and STD prevalence. This reduces the risk of infection per contact and thus the

Table 2. Average HIV infections averted per unit of effective programme output, by prevention strategy and sexual behaviour profile

HIV infections averted, unit of programme output, and prevention strategy	Sexual behaviour profile 1	2	3	4
HIV infections averted per 1,000 condoms				
Sex worker condom use	29	43	–	94
Male condom use	36	11	11	4.4
Family planning condom use	0.3	0.7	0.8	0.2
HIV infections averted per 1,000 health care contacts				
Sex worker STD treatment	274	301	–	946
General population STD treatment	15	45	37	65

Note: Interventions are initiated in year 15.

marginal benefits of condom use over the long run. Through this effect, the higher coverage of the SW condom-use strategy results in a lower average effectiveness per condom.

To compare the average effectiveness of the two STD treatment strategies, we have related the number of infections prevented to the number of health care contacts supplied. In the sex worker STD-treatment strategy, one health care contact includes screening for four classic STDs and treatment of all of those detected. In the general population STD-treatment strategy, a health care contact results when someone with a symptomatic STD seeks treatment for this specific STD. Although the absolute difference in effectiveness of the two STD-treatment strategies on HIV prevalence is not large (figure 4), table 2 shows that many more HIV cases are prevented per health care contact by the treatment strategy focused on SWs.

We have also calculated the average effectiveness per unit of effective programme output for prevention strategies initiated in year 3 of the epidemic. For most combinations of prevention strategies and profiles, results are similar to the results presented in table 2. Although initiating prevention strategies early yields larger benefits, this is usually accompanied by proportionately greater programme outputs.

An exception is Profile 3, in which early prevention has a lower effectiveness per programme output than does intervention in year 15. In the baseline projections of Profile 3, HIV prevalence is still very low for the evaluation horizon of the early intervention (years 3–12). Therefore, many fewer HIV cases can be prevented by early intervention than for an evaluation horizon of interventions starting in year 15.

Section Seven: General discussion

In this paper we showed model-based projections of the course of the HIV epidemic under different sexual behaviour and intervention scenarios. We chose to make these projections for stylised profiles of sexual behaviour, instead of for real-world countries, to emphasize two points:

1. the pattern of sexual behaviour matters, and
2. there is often substantial within-country variation in patterns of sexual behaviour.

Real-world settings may be considered in relation to these profiles. For instance, Profile 1 might to some extent resemble the qualitative pattern of sexual behaviour in a country like Thailand, where commercial sex is widely prevalent (Morris and others 1996). Profile 2 bears some similarity to behaviour in urban areas of sub-Saharan Africa, where multiple and concurrent relationships are sometimes common (Caraël 1995; Morris and others 1995). In the future, the situation in specific areas can be simulated with STDSIM. It is already being applied to the HIV epidemic in Nairobi, Kenya (van der Ploeg and others 1998), and is planned to be applied to Nyanza Province, Kenya.

We have presented the epidemics in terms of HIV prevalence for ease of comparison with real-world HIV epidemiological data. One could also use incidence, which would more directly reflect the impact of interventions on transmission. Since prevalence figures reflect past infections as well as recent ones, the impact of interventions on prevalence is more gradual than is the impact on incidence.

Like all model projections, our results depend on the assumptions. For instance, even within a profile qualitatively describing a pattern of behaviour, different results could have been generated by using different assumptions with respect to age-specific rates of partner change, frequency of use of commercial sex, or the age at onset of sexual activity. Moreover, the assumptions with respect to more general aspects that are profile independent, like the duration of infections, transmission probabilities, and demographic structure, influence the results. Sensitivity analysis of these parameters indicates that the main qualitative results are robust to changes in assumptions made in the baseline (results not shown).

In the evaluation of prevention strategies, we assumed that certain levels of coverage can be reached in a specific target group. Because the group of SWs is much smaller than the group of men in the general population, efforts to achieve coverage levels can be concentrated. Therefore, we assumed that higher levels of behaviour change can be reached among SWs than among the general population. To illustrate the impact of different coverage levels, we also followed a more general approach, in which we calculated how HIV incidence reduction depends on condom use both among SWs and among men (see figure 5).

In practice, the coverage that can be reached will depend on the specific setting. For instance, in settings in which commercial sex is primarily brothel-based it might be much easier to reach high levels of condom use than in settings in which SWs work more informally. Moreover, prevention strategies will also affect persons outside the target group. For instance, for the family planning condom-use strategy we assumed that condoms will only be used in steady relationships. In practice, condoms distributed through the family planning channel might also be used in more risky contacts. We also assumed that it would be possible to reach high levels of behaviour change in the early stages of an HIV epidemic. However, such large behaviour changes may only be possible when people have experienced the seriousness of the HIV threat in their own environment.

At this stage, it is difficult to validate model predictions of the effect of prevention strategies on different profiles with data from the real world, because there are very few trials in which the effects of interventions on population prevalence and incidence of HIV and STDs have been investigated. The only published population-based trial is the STD-treatment trial performed in Mwanza, Tanzania, showing a reduction in HIV incidence of around 40 per cent due to improved STD services (Grosskurth and others 1995). The projected reduction in HIV incidence of the general population STD-treatment strategy for all four profiles is much smaller than was the case in Mwanza. In reality, reinfection might be less frequent than what follows from our assumptions: we assumed that cured STD cases are immediately susceptible to reinfection, while this is not necessarily true. Furthermore, we do not consider any form of partner notification, while in Mwanza 30 per cent of STD cases notified a partner (Mayaud and others 1997). Moreover, at the time of the Mwanza trial HIV prevalence levels were around 4 per cent, which is considerably lower than the prevalence in the four profiles studied. Our estimate of the large impact of condom use among SWs is in line with Thailand's experience, where the 100 per cent condom-use programme in commercial sex has resulted in a decrease in STD cases and in HIV prevalence among military conscripts (Hanenberg and others 1994; Mason and others 1995; Nelson and others 1996; Rojanapithayakorn and Hanenberg 1996).

We have compared the average impact of strategies per unit of programme output, but have refrained from calculating the costs associated with different prevention strategies. The costs vary highly with the specific setting and the target groups (Soderlund and others 1993). Moreover, the marginal costs of prevention strategies will vary with the coverage of an intervention. On the one hand, economies of scale might reduce marginal costs of increased coverage. On the other hand, the costs to reach additional cases might increase considerably after a certain point, because of problems of identifying target groups, resistance to participation in an intervention programme, geographic circumstances, and so on. The most cost-effective intervention may in practice be a combination of focused and unfocused interventions. Condom-use strategies may also save money because they not only prevent HIV directly, but by preventing other STDs they reduce expenditure on STD treatment.

Despite these caveats, we believe the following lessons can be learned:

- Different sexual behaviour patterns induce totally different trajectories of HIV prevalence. An epidemic that starts extremely slowly can still result in high HIV prevalence levels, as shown in Profile 3.
- The more concentrated is risk behaviour, the faster is the initial spread of the HIV epidemic. Saturation effects combined with selective mortality can not only stabilise HIV prevalence, but even result in a decline, as shown in Profile 1.
- Early intervention prevents more HIV infections than late intervention and reduces the peak prevalence of the epidemic.
- Highly targeted condom programmes among sex workers (or those with the most partners) have the highest impact on all three populations with commercial sex. Further, these programmes prevent the greatest number of HIV infections per programme output.
- In countries with mature AIDS epidemics, prevalence cannot be lowered substantially without changing behaviour among those with the most partners. However, behaviour change among other population groups is

also necessary to reduce HIV prevalence to low levels. The latter strategy will not be effective unless pursued alongside behaviour change among those with the highest-risk behaviour.

Appendix 1. Assumptions of the STDSIM model

The assumptions for each of the STDSIM modules are shown below for Profile 2; differences between Profile 2 and the other profiles are indicated in Appendix 2.

Module 1. Demography

Half of all births are males. Assumptions on survival probabilities and age-specific fertility rates are as follows.

Mortality: Life table			Fertility: Age-specific fertility rates	
Age group (upper limits)	Survival probability for: Males	Females	Age group	Birth rate per female per year
1	0.926	0.940	<15	0.000
5	0.900	0.916	15–19	0.080
10	0.891	0.908	20–24	0.185
20	0.874	0.892	25–29	0.185
30	0.844	0.866	30–34	0.140
40	0.806	0.831	35–39	0.075
50	0.744	0.782	40–44	0.035
60	0.632	0.695	45–49	0.020
70	0.438	0.528	50+	0.000
80	0.183	0.256		
90	0.000	0.000		

Module 2. Sexual behaviour

The age at onset of sexual activity is uniformly distributed between 12 and 20 years for both males and females. The duration of casual relationships is Gamma distributed with mean 0.2 year and shape parameter 0.5. The duration of steady relationships is exponentially distributed with mean 100 years – that is, most relationships will end due to the death of one of the partners.

The percentage of new relationships that are casual depends on the age of the male partner and whether he and/or his new partner is already in a steady relationship. For those not in a steady relationship, 100 per cent of new relationships are casual for male partners aged 10–19, 50 per cent are casual for male partners 20–24, 20 per cent are casual for those 25–29, and none are casual for those 30 and older. For persons already in a steady relationship, all new relationships are casual for male partners aged 10–29, and 90 per cent are casual for those 30 and older.

It is assumed that the frequency of intercourse within all relationships is 1.5 times per week.

To match partners to each other we use the concepts of 'availability' and 'active searching'. Every new pair consists of one individual who has been searching actively for a partner and one individual of the opposite sex who is available for a new relationship. The moment of becoming available for a new sexual relationship depends on relationship status. If it takes a long time before an available individual is selected by someone of the opposite sex, he/she will start searching actively for a sexual partner him/herself after a certain period.

- Availability for next relationship when in a steady relationship: Males in a steady relationship become available for a new relationship after a duration that is exponentially distributed with mean 10 years. Females in a steady relationship are not available to start a new relationship in Profile 2.
- Availability for next relationship when in a casual relationship: Both males and females in a casual relationship become available for a new relationship after a duration that is exponentially distributed with mean 1 year.
- Availability for next relationship when not in a relationship: Both males and females who are no longer in a relationship become available for a new relationship after a duration that is exponentially distributed with mean 0.5 years.

The duration between the moment of becoming available and active searching is exponentially distributed with mean 0.5 years.

The duration until availability and the duration until active searching are affected by the age- (time-) dependent promiscuity index and the individual promiscuity index. In this way heterogeneity in sexual behaviour between different individuals and between different age groups is taken into account.

For males and females younger than 25, the age-specific promiscuity indicator is 4. For all other age categories it is 1. Both for males and females the individual heterogeneity in sexual promiscuity is Gamma distributed with mean 1 and shape parameter 2.5.

Sexual mixing is described by the following two tables that show the age preferences of males and females, according to their own ages.

Age preference table for males

Age of male	Age of female								
	<15	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50+
<15	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15–19	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
20–24	0.3	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
25–29	0.1	0.25	0.4	0.2	0.05	0.0	0.0	0.0	0.0
30–34	0.0	0.1	0.25	0.4	0.2	0.05	0.0	0.0	0.0
35–39	0.0	0.0	0.1	0.25	0.4	0.2	0.05	0.0	0.0
40–44	0.0	0.0	0.0	0.1	0.25	0.4	0.2	0.05	0.0
45–49	0.0	0.0	0.0	0.0	0.1	0.25	0.4	0.20	0.05
50+	0.0	0.0	0.0	0.0	0.0	0.1	0.25	0.40	0.25

Age preference table for females

Age of female	Age of male <15	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50+
<15	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
15–19	0.15	0.25	0.3	0.2	0.1	0.0	0.0	0.0	0.0
20–24	0.0	0.1	0.2	0.35	0.25	0.1	0.0	0.0	0.0
25–29	0.0	0.0	0.1	0.2	0.35	0.25	0.1	0.0	0.0
30–34	0.0	0.0	0.0	0.1	0.2	0.35	0.25	0.1	0.0
35–39	0.0	0.0	0.0	0.0	0.1	0.2	0.35	0.25	0.1
40–44	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.35	0.25
45–49	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.7
50+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8

Sex workers begin their careers between the ages of 15 and 24; the maximum age of a sex worker is 30. The duration of sex workers' careers is uniformly distributed between one year and the maximum age of the SWs minus the age that they initiate sex work. Sex workers are assumed to have 10 commercial contacts per week.

Sixty per cent of males within and outside a steady relationship never have sex with SWs; 20 per cent have sex with SWs once per year; and 20 per cent have sex with SWs six times per year. All males stop visiting SWs at age 60.

Module 3. Transmission

The transmission probabilities per contact for HIV and classic STDs are shown in the following table.

	HIV	gonorrhoea	chlamydia	syphilis	chancroid
male to female	0.0050	0.22	0.15	0.25	0.12
female to male	0.0025	0.15	0.12	0.20	0.08

The presence of classic STDs raises the risk of HIV transmission – affecting both susceptibility and infectivity. In the presence of gonorrhoea and chlamydia, the rate of HIV transmission is increased fivefold; in the presence of chancroid and active syphilis, 25-fold. The maximum of the risk-increasing factors of susceptibility and infectivity is taken if both partners have an STD.

The yearly incidence of infection by contacts outside the model population is the same for both males and females – for HIV infection, 0.0001; for gonorrhoea, chlamydia, and syphilis, 0.005; and for chancroid, 0.001.

The probability that an HIV-positive mother passes HIV to her child is assumed to be 40 per cent.

Module 4. Infection/disease

The probability that an STD infection will become symptomatic is described in the following table for men and for women.

Probability of symptomatic infection (%)	HIV	gonorrhoea	chlamydia	syphilis	chancroid
males	100	50	30	70	90
females	100	25	15	30	70

In the absence of effective treatment, the duration of infectivity in weeks is described below, according to the type of STD.

Duration of infectivity with effective treatment (in weeks)	HIV	gonorrhoea	chlamydia	syphilis	chancroid
males	300	9.0	12.0	18.0	13.0
females	300	13.0	20.0	18.0	13.0

For HIV, a final stage of 12 weeks in which no sexual transmission is assumed to take place is defined after the period mentioned above. For syphilis, a period of latent, noninfectious syphilis of 104 weeks is assumed after an untreated first stage of active syphilis.

The duration of HIV in children is Gamma distributed with average two years and shape parameter 0.5.

Module 5. Health care

The duration (in weeks) of infectivity when effective treatment is provided is described below. Only symptomatic cases can benefit from health care and have this shorter duration of infection.

Duration of infectivity with effective treatment (in weeks)	HIV	gonorrhoea	chlamydia	syphilis	chancroid
males	300	3.0	4.0	4.0	3.0
females	300	8.0	8.0	8.0	3.0

Module 6. Interventions

The assumptions on condom use, STD treatment, and STD screening for the different populations – before and after preventive interventions – are in the table below.

Parameter (%)	Before	After
Men insisting on condom use in commercial and casual contacts	5	20
SWs insisting on condom use in commercial contacts	20	90
Women using condoms in steady relationships (as family planning)	0	20
Symptomatic STD cases benefitting from effective treatment	25	75
Coverage of STD screening for SWs	0	90

All persons using condoms are assumed to use them consistently. The condom failure rate is assumed to be 5 per cent, and the maximum age at which condoms are used for family planning is set to 50.

The effectiveness of STD treatment is assumed to be random over STD cases. SWs are screened and treated once per month, and the effectiveness is assumed to be 95 per cent. Participation in SW screening and treatment is assumed to be consistent.

STDSIM uses a long warming-up period (60 years) in order to get a proper distribution of STDs within the population. The initial population of 8,000 grows to a population size at the actual start of the simulation of approximately 20,000–30,000. The simulation horizon is set equal to 30 years, and for the baseline scenario, we assume that HIV infection was introduced in year zero.

The population composition at the outset of the simulations can be described as follows.

Age group	Males	Females
0–9	900	900
10–19	750	750
20–29	650	650
30–39	550	550
40–49	425	425
50–59	325	325
60–69	225	225
70–79	125	125
80–89	50	50

The per cent of people already infected in the initial population is 5 per cent for gonorrhoea and syphilis, 6 per cent for chlamydia, and only 2 per cent for chancroid.

Appendix 2. Comparison of assumptions across sexual behaviour profiles

The differences in some key assumptions among sexual behaviour profiles are described in the table below.

	Profile			
Assumptions	1	2	3	4
Average frequency of commercial sex				
Males not in steady relationship	50%: 6x/yr 50%: 1x/yr	20%: 6x/yr 20%: 1x/yr 60%: never	Never	20%: 6x/yr 20%: 1x/yr 60%: never

(*Table continues on next page.*)

Table *(continued)*

	Profile			
Assumptions	**1**	**2**	**3**	**4**
Average frequency of commercial sex				
Males in steady relationship	20%: 6x/yr 20%: 1x/yr 60%: never	20%: 6x/yr 20%: 1x/yr 60%: never	Never	Never
Per cent of new relationships that are casual				
Persons not in steady relationship	0	100 (10–19) 50 (20–24) 20 (25–29) 0 (30+)	100 (10–19) 50 (20–24) 20 (25–29) 0 (30+)	100 (10–19) 50 (20–24) 20 (25–29) 0 (30+)
Persons in steady relationship	n.a.	100 (10–29) 90 (30+)	100 (10–29) 90 (30+)	n.a.
For persons in a casual relationship	n.a.	M: 1 F: 1	M: 1 F: 1	n.a.
For persons in a steady relationship	n.a.	M: 10 F: n.a.	M: 5 F: 5	n.a.
Promiscuity factor in persons aged 10–24 (both sexes)	0.01	4	4	20

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Part III

The Impact of AIDS on the Health Sector

12

Levels and determinants of expenditures on HIV/AIDS in five developing countries

A. Overview

by Donald S. Shepard

Section One: Introduction and method

The AIDS epidemic poses enormous challenges to the health systems of developing countries. The magnitude of the epidemic requires medical care and social support for those infected. Yet, the threat of future infections demands an effective preventive programme. And AIDS must compete for resources with acute infectious diseases and the growing burden of chronic diseases.

To inform these decisions, policymakers need data about resource flows for AIDS in their own countries, as well as comparative data and insights from other countries. This study sought to answer the following questions in selected countries:

- What is the level of health sector expenditures related to AIDS, and how are they divided by use of funds (prevention, treatment, and mitigation) and by source of financing (public, private, and donor)?
- How do AIDS expenditures relate to overall health expenditures by use and source of funds?
- What are some of the major determinants of the level and pattern of expenditures and financing?

This study is based on case studies from five developing countries with moderate to severe AIDS epidemics and a range of economic conditions: Brazil (Iunes et al 1998, this volume), Côte d'Ivoire (Koné et al 1998, this volume), Mexico (Izazola et al 1998, this volume), Tanzania (Tibandebage et al 1998, this volume), and Thailand (Kongsin et al 1998, this volume). A common methodology was used across all five case studies. This chapter begins with an overview of the methodology and a comparison of the results across countries and is followed by the detailed case studies themselves.

1.1 Sources of expenditure data

Each case study relied on a combination of objective and subjective information. The study used five sources of expenditure data:

- financial reports of public expenditures or budgets

- country workshops to estimate treatment costs by type of patient
- special health sector analyses (Tanzania only)
- a detailed database of public hospital claims (Brazil only)
- household surveys (Thailand only).

Detailed estimates of expenditures were obtained according to the use of funds (prevention, treatment, and mitigation of the impact of AIDS) and by the source of finance. Where objective information was missing, incomplete, inconsistent, out-of-date, or of questionable accuracy, we consulted informed experts. Except for countries where public sector health expenditure data were available from special studies, public budgets were used to estimate public expenditures.

Total health expenditures and the breakdown among public, private, and donor financing were based on Murray, Govindaraj, and Musgrove (1994), using data for 1990. We extrapolated overall health expenditures to the target year by assuming the same ratio of health expenditure to GDP and the same distribution of expenditure among funders (public, private, and donors) as in 1990. The specific sources of data are described in each case study.

In the time available for this study, Brazilian data on AIDS expenditures could be obtained only for the state of São Paulo, with a population of about 33 million and 54 per cent of Brazil's reported AIDS cases. While data on AIDS cases were available for the state, other economic and expenditure data had to be inferred from national information. According to the United Nations Development Programme, the state's 1991 income per capita was 72 per cent higher than income per capita in Brazil as a whole. We assumed that the same ratio applied to per capita GNP and GDP. We also assumed that the national share of GDP spent on health reported in Murray et al (1994) also applied to the state. These assumptions provided the basis for estimating private health expenditures in São Paulo state.

1.2 Expenditure by use and source of finance

Preventive expenditures were expenditures primarily intended to prevent new HIV infections. They include information, education, and communication about HIV; promotion, purchase, and social marketing of condoms through AIDS control programmes; testing and screening for HIV of persons without HIV symptoms; and screening of blood for transfusions. Expenditures undertaken for another purpose were not counted as HIV prevention, even though they may contribute indirectly to preventing HIV transmission. For example, condom promotion for purposes of family planning, or treatment of sexually transmitted diseases (other than HIV) for the purpose of treating and controlling those conditions, or programmes to empower women generally to resist unwanted sex were not counted in HIV prevention. Treatment expenditures are designed to care for persons with HIV. They include expenditures not only on Western medical care but also, insofar as possible, expenditures on traditional medicine.

Mitigation efforts, such as aid to orphans whose parents died of AIDS, proved hard to measure systematically in this study. Most assistance was provided by small NGOs that did not report to any government entity. Some of these efforts are detailed in the individual case studies. For the purposes of this overview, we focus on expenditure for prevention and treatment.

1.3 Delphi estimates

The study consulted groups of experts in each country to estimate the treatment costs for AIDS patients. In Côte d'Ivoire, Mexico, and Tanzania, the estimates were obtained in a workshop of care providers (doctors, nurses, and traditional practitioners) from both urban and rural areas. In Brazil and Thailand, experts were interviewed individually. Interviewees estimated the number of visits, prescriptions, hospital use, and costs for AIDS for each of several categories of public and private patients. Where possible, the estimates were checked against independent objective sources (e.g., against public sector expenditures for hospital care).

Costs were estimated for patients attending public and private health care in rural and in urban areas. Where clinical experts did not have reliable information on unit costs of services, information on quantities of services were merged with information on unit costs from other sources to estimate expenditures. To illustrate this process, table 1 shows an excerpt of the questions used and results obtained in Côte d'Ivoire.

To estimate treatment costs, we multiplied a lifetime cost per patient times the number of patients of each type. The number of patients were estimated from a three-step process:

1. The number of officially reported AIDS cases was obtained.
2. These figures were adjusted by an expansion factor to correct for under-reporting. The expansion factor is often derived from analysis of deaths during a historical period. Increases in deaths from conditions

Table 1. Workshop estimate of lifetime treatment per 'other (non-insured) Abidjan patient'

		Workshop participant				
Component of treatment	**Unit**	**A**	**B**	**C**	**D**	**Average**
Consultations with generalist physician	Visits	10	10	10	5	8.8
Consultations with specialist physician	Visits	2	1	1	0	1.0
Days with ambulatory care	Days	20	5	5	5	8.8
Nights in a hospital	Nights	15	15	20	15	16.3
Nights in other health facilities	Nights	5	3	2	3	3.3

that may be complications of AIDS represent true numbers, while declared cases are the reported numbers.

3 The estimated totals were allocated among types of patients using expert opinion and information about how underreporting varies by location.

In Côte d'Ivoire and Thailand, for example, the number of reported cases was only about a seventh of the epidemiologically estimated total. Demographic projections also provided a basis for estimating AIDS cases. It can be assumed, on average, that each patient who died of AIDS would have met the diagnostic criteria a year earlier.

As AIDS surveillance largely comes from public sector hospitals, reported cases likely received medical care. Cases may go unreported because their data were not recorded by busy providers, were lost, or invalid or, more commonly, because they were treated outside of the public health care sector or not treated at all. Workshop participants and other informants were asked to extrapolate for missing data. Data were assembled for the single most complete year – 1994 or 1995.

1.4 Validation of estimates

Since the number of AIDS cases is a sensitive issue, this study attempted to validate and adjust estimates derived from one source with information from another independent source whenever possible – a process termed 'triangulation.'

For example, in estimating public sector hospital expenditures on AIDS treatment in Côte d'Ivoire, we estimated the total number of days of hospital care received by AIDS patients based on the country workshop. We then compared this with the total number of occupied hospital bed days, obtained from the country's health information system. From this we calculated that 21 per cent of occupied hospital beds were filled with HIV or AIDS patients. Given a national seroprevalence rate of about 5 per cent, this share seemed reasonable to national officials. Similarly, providers' estimates about the cost of a service can be verified from the expenditures of that service. In Tanzania, for example, donors corroborated providers' estimates of the costs of protecting the blood supply.

1.5 Adjustment for purchasing power parity

Most international economic comparisons seek to standardise for differences among countries by converting all amounts into a single, convertible currency, often US dollars. The conversion is usually based on the average midyear market exchange rate for the year of the conversion. The market exchange rate is governed only by traded goods and services – generally a small share of economic output.

To adjust for international differences in purchasing power, economists have created the concept of gross national product (GNP) per capita in 'international dollars' – that is, adjusted for purchasing power parity (PPP). An international dollar buys the same amount of GNP in another country as one US dollar buys in the United States. The World Bank (1996) has computed GNP per capita for all five countries used in these case studies in both international dollars and US dollars (at market exchange rates).

Because wage rates are generally lower in developing countries than in industrialised countries, many domestic prices tend to be lower than those in the United States. PPP-adjusted GNP per capita is therefore substantially higher than in US dollars. Generally, the poorer the country, the greater the discrepancy between the two measures of GNP. Thus, among the five countries in this study, the difference is most dramatic for Tanzania: its 1994 GNP per capita in international dollars ($620) is 4.42 times the amount in US dollars ($140).

To improve international comparability in this Overview, we expressed all of our salient measures – expenditures on AIDS, all health expenditures, GNP, and GDP – in international dollars. The conversion was based on a four-step process:

- We summarized the most recent AIDS expenditures for each country into a 3 x 3 matrix of sources by uses expressed in the currency in which the data were compiled. Côte d'Ivoire, Tanzania, and Thailand used local currency (CFA francs [FCFA], Tanzania shillings, and Thai baht, respectively), while Brazil and Mexico used US dollars at market exchange rates because of high inflation rates.
- Local currencies were converted to US dollars at the current market exchange rates for the year for which the data were compiled.
- Amounts were converted from US to international dollars by multiplying by the country's purchasing power parity ratio for 1994 – the ratio of its per capita GNP in international dollars to its GNP in US dollars – based on World Bank (1996) data. As the 1994 entries were the latest data and were generally based on regression estimates, it was plausible that these ratios would apply to 1993 or 1995 as well.
- Amounts per capita in international dollars were calculated by dividing each country's total by its estimated population, generally for 1994 (World Bank 1996). They were extrapolated to the needed year based on the compound annual growth rate.

Section Two: Results

2.1 Total AIDS expenditure

Table 2 shows AIDS and health expenditures per capita by source and use of funds, in international dollars. Countries are ordered from lowest to highest PPP-adjusted per capita GNP.[1] Total public and private expenditure per capita ranges from $1.48 to $8.69, with an unweighted average of $4.36. Levels of spending are determined by several factors.

- A country's public and private ability to pay for curative and preventive care and the sophistication and costliness of its health system. This can be proxied by GNP per capita. The state of São Paulo, Brazil, with the highest per capita GNP, also has the highest AIDS expenditures per capita. With the exception of Mexico (where the incidence of AIDS is lowest), public funding per capita rises steadily with per capita GNP.

- The incidence of AIDS, which affects the costs of curative care. Since a person with AIDS lives for about a year in many developing countries, the number of new AIDS cases per year (incidence) approximates the number of people alive with AIDS. Variations in incidence explain why Tanzania, with the highest incidence rate (14.3 per 100,000), has moderately high expenditures despite having the lowest GNP per capita, while Mexico, with the lowest incidence, also has the lowest expenditures despite the second highest GNP per capita.
- Political factors within the country and the donor community. Tanzania's egalitarian ideals and relatively honest administration have long earned respect from the international donor community and helped the country gain donor funding for its AIDS control programme. Thailand's openness in addressing AIDS through its National AIDS Task Force, chaired by the prime minister, has also generated relatively high donor support.

Table 2. AIDS and health expenditure for five countries[a]

	Tanzania		Côte d'Ivoire		Thailand		Mexico		São Paulo state, Brazil		Average	
	$	(%)	$	(%)	$	(%)	$	(%)	$	(%)	$	(%)
Total AIDS expenditure per capita	3.73	(100)	3.18	(100)	4.76	(100)	1.48	(100)	8.69	(100)	4.37	(100)
By source of funds												
Public	0.20	(5)	1.34	(42)	3.45	(72)	0.76	(52)	5.78	(67)	2.31	(48)
Private	0.40	(11)	1.69	(53)	0.76	(16)	0.70	(47)	2.65	(31)	1.24	(31)
Donor	3.12	(84)	0.16	(5)	0.56	(12)	0.02	(1)	0.26	(3)	0.82	(21)
By use of funds												
Preventive	3.13	(85)	0.23	(7)	3.07	(64)	0.55	(37)	1.32	(15)	1.66	(42)
Treatment	0.54	(15)	2.94	(92)	1.69	(36)	0.92	(62)	7.37	(85)	2.70	(58)
Public AIDS expenditure per capita												
By use of funds												
Prevention	0.05	(25)	0.08	(6)	2.51	(73)	0.31	(41)	0.18	(3)	0.63	(30)
Treatment	0.15	(75)	1.25	(94)	0.94	(27)	0.45	(59)	5.60	(97)	1.68	(70)

	Tanzania	Côte d'Ivoire	Thailand	Mexico	São Paulo state, Brazil	Average
Total health expenditure per capita ($)						
	28	48	310	157	417	155.31
AIDS as % of health expenditure						
Public expenditure						
	3.1	5.7	5.4	1.9	2.6	3.8
Total expenditure						
	13.3	6.7	1.5	1.8	2.1	5.1
Health expenditure as % of GNP						
	4.50	3.49	4.45	2.17	4.50	3.82
Other data						
GNP/capita						
	620	1,370	6,970	7,040	9,310	5,062
Population (millions)						
	28	14	58	90	33	45
Adult HIV prevalence (%)						
	6.40	6.80	2.10	0.40	0.75	3.29
AIDS incidence						
Number of cases						
	40,000	18,000	39,000	6,000	8,802	22,360
Rate per 100,000						
	143	126	67	6.7	27	50

Note: Sums may not total due to rounding.

a. All expenditures and GNP/capita are in 1993–95 international dollars.

Source: AIDS and health expenditure estimates, authors' calculations (see text); GNP/capita in international dollars and population, World Bank (1996); adult HIV prevalence, World Bank (1997); AIDS incidence, country case studies (number of cases) and authors' calculations (rate per 100,000).

2.2 Total AIDS expenditure by source of funding

Donor funding is by far the largest share of resources in Tanzania (84 per cent); in the other countries, international donors fund no more than 12 per cent of total AIDS expenditures. On average, donors finance (counting each of the five countries equally) 21 per cent of AIDS expenditures, or $0.82 per capita.

The importance of donor funding outstrips its monetary value. It is insulated from domestic political pressures by patients and providers to spend more on curative care. Further, it can play a catalytic role, showing the effectiveness of prevention and sparking contributions from other sources of funding.

2.3 Total AIDS expenditure by use of funds

The highest share of total (public and private) expenditure on prevention is in Tanzania (85 per cent), followed by Thailand (64 per cent). In contrast, prevention is only 15 per cent of total AIDS expenditure in São Paulo state and 7 per cent in Côte d'Ivoire. One reason for these large differences is the contribution of private expenditure: governments control public expenditures directly, whereas governments influence private expenditures only indirectly. In Côte d'Ivoire, Mexico, and São Paulo state, where the share of total AIDS expenditure for prevention is lowest, private expenditure on AIDS is highest.

2.4 Public AIDS expenditure by use of funds

Both the public goods aspect of AIDS prevention and the high cost-effectiveness of prevention, compared with AIDS treatment, suggest that the priority for government expenditure is prevention. When the share of *public* funding devoted to prevention is analyzed separately, Thailand stands out, with nearly three-quarters of public funds devoted to prevention, or $2.31 per capita. Mexico spends 41 per cent of public AIDS funds on prevention, but overall expenditure is very low. Further, in Thailand most prevention expenditure is from domestic sources, indicating a high political commitment to prevention. In contrast, in Tanzania most funding of prevention in Tanzania is from donors.

Broomberg (1996) estimated the worldwide cost in all developing countries of a comprehensive programme of AIDS prevention. Although some private or donor funding could be used (particularly for blood supply and STD treatment), public funding would be needed as the primary source of finance. The need for public or donor funding arises because many preventive services are public goods (e.g., information, education, and communication) or have positive externalities (e.g., social marketing of condoms). As continued donor funding depends on the salience of AIDS in relation to other development problems and on the priority of a specific country to the donors' worldwide interests, public funding is often more stable than donor funding.

Broo

The estimated cost of worldwide prevention, according to Broomberg, would range from US$1.48 billion to US$2.17 billion (at market exchange rates), or $0.63 to $0.93 in international dollars per person when spread over the worldwide population of 4.689 billion people. By this standard, only Thailand has adequate public spending on prevention, and only Tanzania, Thailand, and São Paulo state have adequate total spending on prevention. The composition of prevention expenditure (not shown here) is also important. For example, the level of spending on prevention in Mexico – total and public – falls below Broomberg's estimated needs, and almost all preventive expenditures in that country were spent on blood safety and worker testing, which will not prevent as many cases of HIV as would other preventive programmes, like condom distribution.

2.5 The cost per case for AIDS treatment

Treatment expenditure per capita is the product of AIDS incidence times the lifetime cost per case. In table 3, we calculate the cost of treatment per case and express it as a multiple of per capita GNP (both in international dollars). The cost per case ranged from 0.4 (in Thailand) to 3.0 (in São Paulo state) times per capita GNP, with a mean of 1.5. The low estimate from Thailand occurs because many AIDS patients were thought not to receive treatment, whereas the high estimate in São Paulo state is due to a system of universal curative health insurance that provides good financial access to publicly financed care in both public and private health facilities.

Table 3. Cost of treatment per AIDS case

	Tanzania	Côte d'Ivoire	Thailand	Mexico	São Paulo state, Brazil	Average
Cost per case in international $	414	2,335	2,516	13,868	27,639	9,354
As a multiple of GNP per capita	0.7	1.7	0.4	2.0	3.0	1.5

Source: Authors' calculations, converted to international dollars and multiples of GNP per capita using World Bank (1996) data.

Because control of infectious diseases is usually regarded as a public good, AIDS treatment has received public subsidies. At least two of the countries – Côte d'Ivoire and Thailand – provide special subsidies for AIDS treatment. On more careful scrutiny, however, the rationale for public subsidy fails. The infectious disease rationale would argue for treatment of curable STDs, which eliminates the possibility of transmission among those who are most sexually active. AIDS, on the other hand, cannot be cured. Further, by the time an AIDS patient needs hospital care, he/she may have very few sexual partners due to declining health and the impact of prevention messages. Thus, treatment for AIDS is likely to have a negligible effect on HIV transmission in the population.

2.6 AIDS as a share of total health expenditures

The share of total health expenditures consumed by AIDS is highest in Tanzania (13 per cent) and Côte d'Ivoire (7 per cent), due to their high incidence of AIDS and relatively low health expenditures. Thailand, which had the second highest AIDS expenditures per capita and per case, also has the lowest share of health expenditures devoted to AIDS (1.5 per cent). AIDS expenditures are estimated to be about 2 per cent of health expenditure in São Paulo state, Brazil, where per capita expenditures are highest. Note, however, that these data date from the period before the Brazilian government undertook to finance triple-drug antiretroviral therapy for AIDS patients, and the share has most probably increased (see the discussion below). On average, 5 per cent of total health expenditures are devoted to AIDS in the five countries.

The share of *public* health expenditures devoted to AIDS averages 3.8 per cent. The shares of public and total expenditures devoted to AIDS differ by more than 1 percentage point only for Tanzania and Thailand. In Tanzania, the share of public expenditures on AIDS is much lower because of substantial donor funding for AIDS prevention. In Thailand, the share of prevention in public funds is larger because Thailand's extensive prevention programme is predominantly funded from public sources.

Section Three: Public policies for subsidies of AIDS treatment

Fairness

The World Bank (1997) argues that 'the prudent, efficient, and equitable course' is to subsidise treatment of AIDS to the same extent as curative health services generally. This policy would avoid discrimination against persons with AIDS and also against people with other diseases. In fact, subsidy rates vary substantially across countries.

Figure 1 compares the share of AIDS treatment expenditures that are publicly financed to the share of overall curative health expenditures that were publicly financed as of 1987. For example, in Tanzania, only 26 per cent of AIDS treatment is publicly financed, compared to 31 per cent of all treatment expenditures.[2]

The extent of public subsidies for AIDS treatment in these five countries generally increases with per capita GDP. In three of the countries (Côte d'Ivoire, Mexico, and Tanzania), AIDS treatment receives less public subsidy than curative health care overall. On the other hand, São Paulo state and Thailand provide a greater public subsidy for AIDS treatment than for other curative care. The variation in subsidies reflects the interaction of AIDS policies, the country's health financing strategy, and the stage of the epidemic.

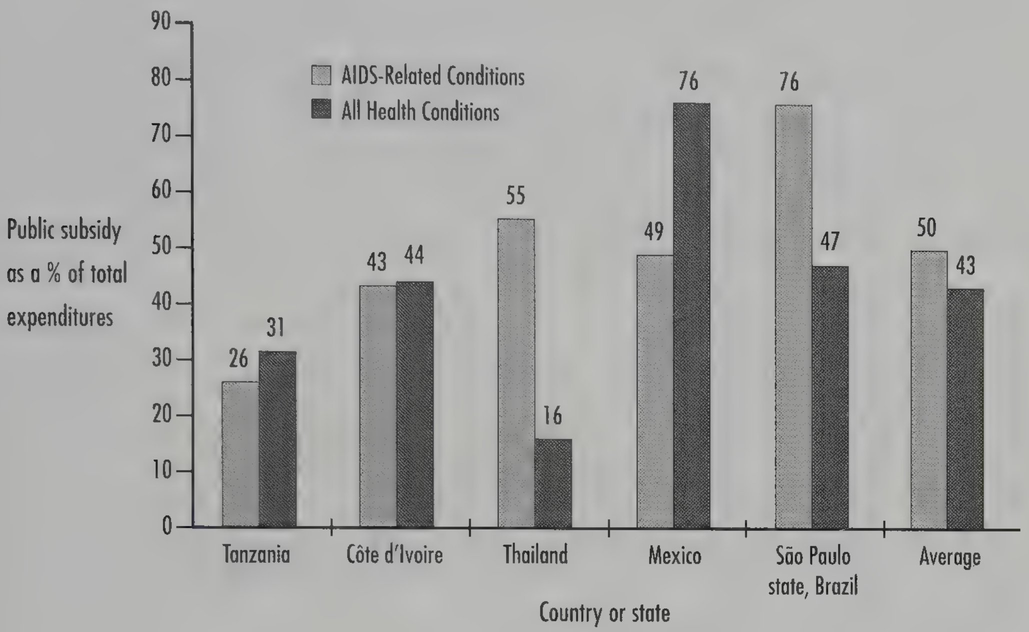
Tanzania

With a high adult HIV prevalence rate (6.4 per cent), Tanzania offers no special treatment programmes for AIDS patients. Moreover, as the country has only two major teaching hospitals, opportunities for sophisticated treatment are extremely limited.

Côte d'Ivoire

Two opposing forces operate. A factor favoring greater public subsidy is the fact that the Ministry of Health extended the special public health status of infectious diseases to AIDS treatment. Although most patients must pay fees at teaching hospitals amounting to about a quarter of their costs, AIDS patients are admitted to the national infectious diseases unit free of charge. Located in

Figure 1. The per cent of AIDS treatment and all curative health expenditure that is publicly financed



the largest of the teaching hospitals in the country's capital, it provides the most sophisticated hospital treatment available free of charge. On the other hand, active private financing tends to reduce the public share in Côte d'Ivoire. Several nongovernmental organisations (NGOs), the private sector, and traditional medicine all treat significant numbers of AIDS patients.

Thailand

The government's policy of financing antiretroviral therapy and the admission of AIDS patients to heavily subsidised infectious disease hospitals substantially raised public expenditures on AIDS relative to other conditions. More recent data, not reflected in this study, shows that public expenditures for antiretroviral drugs have continued to rise through 1996. In 1997, the Ministry of Health reviewed its policies toward payment for this therapy. AZT is being made available to pregnant women, where a recent trial confirmed that even a very limited dose can reduce perinatal HIV transmission by 51 per cent (Bhatiasevi 1998). Subsidised antiretroviral drugs will also be made available under appropriate clinical protocols to poor patients. The AIDS programme had found that the costs of unmonitored distribution of AZT and other antiretroviral drugs was rising rapidly as more and more patients initiated treatment. As the drug was being administered, it appeared to confer little benefit on the patients involved. As patients traveled between their homes and rural areas and sometimes sought to avoid being identified as AIDS patients, their treatment was often too sporadic to be effective. While the new policy is expected to reduce these losses, antiretroviral treatment for populations other than pregnant women remains expensive and problematic.

Mexico

The majority of curative expenditures are made by the largely publicly funded social security system. As many employers screen for HIV and try to avoid hiring or to terminate persons with AIDS, infected workers are reluctant to disclose their status through employer-sponsored treatment. Proximity to the United States has fueled demand for the latest antiretroviral drugs. As public sources cannot provide these drugs, patients must rely on donations and private purchases, thereby reducing the public share. These potentially discriminatory factors tend to lower public subsidy for AIDS care compared to that for curative care overall.

São Paulo state

Brazil has a universal health insurance system that facilitates access to curative services for all types of hospital care. Thus, São Paulo state's share of publicly financed treatment expenditures is higher than the five-country average and higher than for health care generally. Private insurers try to deny coverage of AIDS care, and private hospitals do not feel adequately paid for admitting AIDS patients, so most are treated at public hospitals, where the government subsidises antiretroviral drugs.

These expenditure patterns demonstrate some of the consequences of public provision of antiretroviral therapy. Among the five countries, both Brazil's São Paulo state and Thailand have policies that offer substantially higher subsidies for AIDS treatment than for health services overall. And public subsidies for AIDS treatment are likely to be even higher in the future in both countries. Brazil expanded the public provision of antiretroviral drugs in 1997 in response to political pressures. Actual expenditure surpassed the original estimates midway through the year, requiring supplemental funds. In 1998, antiretroviral therapy will represent a striking 4 per cent of the budget of the Ministry of Health. On the other hand, Thailand also has the highest share of the public AIDS expenditure devoted to prevention. While its policy on antiretroviral drugs should promote more rational use, the growing number of AIDS patients will inevitably raise costs.

Notes

1 The countries would also rank in the same order in GNP per capita in US dollars.

2 Because of a number of refinements, the results in figure 1 differ somewhat from earlier data used to generate figure 4.5 in World Bank (1997). However, the main pattern of subsidies across AIDS treatment and other curative care remains the same.

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B. Expenditures on AIDS in Côte d'Ivoire

by Tiékoura Koné, Adèle Silué, Justine Agness-Soumahoro, Richard N. Bail, and Donald S. Shepard

Section One: Introduction and methodology

This study analyses the expenditures on AIDS in Côte d'Ivoire in relation to total health care expenditures; the source of funding for treatment, prevention, and activities to mitigate the impact of AIDS; and the determinants of these funding patterns. In particular, we show how current government policies result in explicit and implicit subsidies that support hospital care.

As insufficient systematic data on costs and expenditures were available, we organised a workshop in May 1996 in Abidjan with eight AIDS experts, including physicians, leaders of nongovernmental organisations (NGOs), epidemiologists, health economists, a traditional practitioner, and representatives of the National AIDS Control Programme (NACP). Using a structured survey, workshop participants estimated the costs of treatment for various types of patients. To improve and adjust these preliminary estimates, additional data were collected from government documents, international institutions, research studies, prescribing guides, and NGOs (Boyou 1993; Vidal 1992a, 1992b).

Workshop participants first estimated the number of AIDS patients in Côte d'Ivoire, then classified them according to the type of treatment they were likely to have sought, estimated the cost of each type of treatment, and obtained total costs by multiplying the number of each type of patient by the estimated unit cost for each type of treatment.

As of 1995, there were 5,380 reported AIDS cases in Côte d'Ivoire, of which 3,401 were in Abidjan (the largest and capital city), 990 were in the interior, and 989 were reported from the Anti-Tuberculosis Centre (ATC). Only one in three AIDS cases is thought to be reported in Abidjan and only one in seven cases elsewhere in the country (personal communication, Department of Epidemiology, NACP). Using this information, we estimated that there were 18,122 new AIDS patients in 1995, of which 10,203 were in Abidjan, 6,903 in rural areas, and 989 in the ATC.

Table 1. Lifetime treatment costs[a] per AIDS patient and total treatment costs, by type of AIDS patient, 1995 (thousands of FCFA)

	Type of patient														
	Private coverage			Civil servants			Other urban Abidjan			Urban interior			Rural		
Costs per AIDS patient	No. units	Unit cost	Cost per pt.	No. units	Unit cost	Cost per pt.	No. units	Unit cost	Cost per pt.	No. units	Unit cost	Cost per pt.	No. units	Unit cost	Cost per pt.
Generalist consultation	10	12	120	10	3.8	38	8.8	4.8	42	7	2.2	15	3.3	1	3
Specialty consultation	3.3	14	46	1	6.5	7	1	7.5	8	0.5	5	3	0	5	0
Ambulatory day care	1.25	42.5	53	8.8	9	79	8.8	13	114	5	8	40	2	3	6
Emergency night visit	1	40	40	3	8.8	26	3.3	8.8	29	4.3	8.8	38	1.5	5	8
Hospital days	34	52.5	1,785	20	10.6	212	16.3	15	245	14	5	70	5	5	25
Antiviral drugs			306			0			0			0			0
Other medications			270			83			60			46			21
Lab and x-ray			130			35			19			8			4
Traditional medication			28			28			28			28			28
Total/patient			2,778			507			544			247			94
Total costs															
Number of patients			906			1,812			8,699			3,624			3,081
Total cost (000 FCFA)			2,516,709			918,593			4,735,866			895,128			290,538

a. Since the estimated lifetime of an AIDS patient at diagnosis was one year, these figures are also annual costs per patient.
Source: Authors' calculations.

The workshop participants defined five mutually exclusive and exhaustive categories of patients believed to have similar treatment cost profiles and estimated the per cent of patients in each category: private coverage (5 per cent of patients); civil servants (10 per cent); other patients in and around Abidjan (48 per cent); patients in urban areas of the interior (20 per cent); and patients in rural areas (17 per cent).

Section Two: Estimating treatment costs

In order to estimate the costs of AIDS treatment, the experts defined a list of composite parts of treatment, the number of units consumed per patient, and unit costs for each of the five categories of patients (table 1). All costs were expressed in the national currency (the CFA franc, or FCFA) as of the time of the workshop, with exactly 100 FCFA equal to one French franc and approximately 500 FCFA equal to one US dollar.

Unit costs were based on studies done in Côte d'Ivoire in 1993 (Boyou 1993; MSP 1993), increased by 10 per cent to adjust for modest inflation in health sector costs and rounded to the nearest 100 FCFA. The cost of a specialist consultation (7,500 FCFA) was computed as a weighted average of the cost for otolaryngology (11,737 FCFA) and ophthalmology (5,661 FCFA). The cost of an AIDS consultation in other interior urban and rural areas (2,200 FCFA) is much lower than that in Abidjan because health services are generally less sophisticated and less costly outside of the capital. Similarly, the cost of one night of hospitalisation in interior areas (6,100 FCFA) is substantially less than the amount in Abidjan (15,000 FCFA). The cost of traditional medicine per patient (28,000 FCFA) was the midpoint of the workshop estimate of 24,000 FCFA and Boyou's (1993) estimate of 31,000 FCFA from a study on traditional care practices.

The total units and costs for patients in each of the five categories were calculated by multiplying the costs per patient by the estimated number of patients in each category. Finally, the workshop participants estimated the share of treatment expenditures for each of the five categories of patients financed by households, the government, insurance (including employer payments), and other payers.

Estimated expenditures on prevention and mitigation activities were obtained from the National AIDS Control Programme, as shown in table 2. This table excludes public and private expenditures on condom marketing and purchases, however, as these data were not available.[1] These data were merged with estimated expenditures for treatment to arrive at an estimate of total AIDS expenditure.

Table 2. Budget and disbursements through the National AIDS Control Programme, 1994–95 (thousands of FCFA)

		Disbursement	
Source	**Budget**	**Per cent**	**Amount**
Government	450,000	60	270,000
Donors			
French Cooperation	128,173	80	102,538
German Cooperation	195,000	80	156,000
UNDP	195,000	50	97,500
WHO	120,301	85	102,256
Other	32,192	–	33,149
Total	1,120,666	68	761,443

Source: PNLS 1994a, 1994b, 1994c, 1995.

To put AIDS expenditures in context, we compared them with the entire government health budget, which was estimated using the published data for 1990 by Murray and others (1994). They provide a breakdown of expenditures from public, private, and international sources and separate preventive and curative expenditures. These were extrapolated to 1995 assuming that the percentage of GDP devoted to health and the related shares of public, private, and donor financing had not changed. Per capita GDP from 1993 was assumed to have grown by 2 per cent per year based on the country's reasonably favourable economic performance (World Bank 1995).

In order to estimate the share of total bed days and hospital costs accounted for by AIDS patients, we obtained from the Ministry of Health the numbers of inpatient beds, consultations, bed days, and budgets for each type of hospital (MSP 1993, 1995, 1996). A 'bed-day equivalent' represents the amount of hospital services equivalent to one patient day of inpatient hospital care. One inpatient hospital day is one inpatient bed-day equivalent. Using the rule of thumb that one ambulatory consultation costs about one-quarter of a hospital bed day (Barnum and Kutzin 1993), we converted each ambulatory consultation into one-quarter bed-day equivalent. We were then able to estimate the cost per bed day for public health facilities. AIDS accounted for more than a fifth (21 per cent) of all hospital bed days in the country. Given that Côte d'Ivoire has an adult seroprevalence rate of 6.8 per cent (World Bank 1997) and that HIV/AIDS patients are hospitalised much more often than non-infected patients, this share is plausible.

Section Three: Patterns of expenditures

Total government health expenditures for 1995 were 50.1 billion FCFA (US$100 million), of which 76 per cent was spent on curative care and 24 per cent on prevention.[2] Total government spending on AIDS amounted to 4.3

Table 3. HIV/AIDS expenditures by use and source of funding (thousands of FCFA)

Use	Government	Private	Donor	Total
Treatment	3,980,314	5,083,847	289,000	9,353,161
(column %)	(93.6)	(100.0)	(37.0)	(92.5)
Prevention	270,000	na	462,471	732,471
(column %)	(6.4)	na	(59.3)	(7.2)
Mitigation	na	na	28,972	28,972
(column %)	na	na	(3.7)	(0.3)
Total	4,250,314	5,083,847	780,443	10,114,604
(column %)	(100.0)	(100.0)	(100.0)	(100.0)
As a % of spending by all sources	42.0	50.3	7.7	100.0

Source: Authors' estimates based on the workshop and PNLS 1994a, 1994b, 1994c, 1995.

billion FCFA, of which 88 per cent went toward curative services and 12 per cent went for prevention (table 3). Thus, government subsidises curative services more than prevention for all health activities combined, but treatment for AIDS patients is subsidised to an even greater extent, even though at the present time treatment can do little to reduce the burden of disease from AIDS.

AIDS expenditures represented 8.5 per cent of total health spending. Most AIDS expenditures were financed by private sources (50.3 per cent) as compared to government (42.0 per cent) and donor sources (7.7 per cent). Treatment expenditures (92.5 per cent of total expenditures on AIDS) were far in excess of prevention (7.2 per cent) or mitigation (0.3 per cent) expenditures. Households, insurers, and employers together paid more in curative AIDS expenditures than the government (54 per cent vs. 43 per cent). Expenditures for prevention were mostly borne by donors (63 per cent) as compared to the government (37 per cent).

The cost of hospital stays represented nearly half (48 per cent) of the cost of AIDS treatment, followed by drugs (15 per cent), ambulatory day care (14 per cent), and consultations (6 per cent). Expenditure on AZT and other newer AIDS drugs was thought to be minimal but could not be quantified from the data available to us.

Privately covered patients represented only 5 per cent of all AIDS cases but 27 per cent of all treatment expenditure, while rural patients accounted for 17 per cent of AIDS cases and received only 3 per cent of expenditure. On the other hand, other Abidjan patients and civil servants received roughly the same share of treatment expenditure as their proportion of the total caseload (10 per cent and 51 per cent, respectively).

The government subsidised the greatest percentage of costs for urban patients: 63 per cent for Abidjan and 59 per cent for interior urban patients. This share exceeded the government percentage subsidy even for civil servants (44 per cent). The poorest category of patients (rural) received the least subsidy by the government (38 per cent), except for those privately covered patients who were not directly subsidised by government (but may have enjoyed substantial indirect government subsidies by virtue of their greater access and utilisation of government facilities).

Section Four: Determinants of expenditures

The very high percentage of expenditures on curative services is strongly determined by hospitalisation costs. The fact that hospitalisation costs are very high in Côte d'Ivoire may be due in part to the large number of hospital beds, especially in Abidjan, with three tertiary, university-teaching hospitals, and also to the fact that there are many, relatively more expensive, private hospital beds.

The predominance of hospitalisation costs is also likely related to patterns of health care–seeking behaviour among the population and to referral decisions by caregivers. Many people are conditioned to seek and expect hospitalisation when they become critically ill, regardless of whether the hospitalisation is likely to cure them. The expectation that effective drugs might be available in hospitals, whether that is the reality, probably also contributes to the patients' expectation to be hospitalised. Some patients may also seek a reduction in the stigma attached to AIDS through hospitalisation since doctors often protect AIDS patients and their families by giving some other diagnosis besides AIDS. Caregivers are trained to treat intensively with hospitalisation when the patient is critically ill, and since they do not directly bear the costs for hospitalisations, there is little incentive for them to decide to withhold it. The lack of good alternatives (home care or care in the community) for both the patient and the caregiver allows this pattern to continue. Espoir Côte d'Ivoire, an Abidjan-based organisation with donor support, provides nonhospital care to some urban patients, but even its services are too costly to be replicated nationally.

Privately covered patients incur the highest costs per case most likely because they are wealthier and because most of their expenditures (estimated to be 80 per cent) are financed by insurance, which encourages unnecessary utilisation. Generally, employers pay most of the insurance premiums (Koné et al 1994). Rural patients, on the other hand, have fewer disposable assets to begin with and have less ready access to facilities than do urban patients. Transportation expenses and costs related to leaving subsistence farming occupations are also disincentives for rural patients to use hospitals. Also, there is, in general, little capacity to treat AIDS patients through primary care in the periphery. It may be that medications are less available in hospitals that serve rural patients; this factor is a relative disincentive for rural patients to seek care.

The fact that donors' expenditures are predominantly directed toward prevention is consistent with most other African countries. In general, donors believe that prevention strategies are the most important long-term approach to reducing the burden of disease. Undoubtedly, the financial straits of the Ministry of Public Health, together with the salient demand for crisis-type curative care, have constrained the government's expenditures on prevention, and there are at present no government programs to mitigate the effects of AIDS on families of patients.

The expenditures of approximately 60 small NGOs in Côte d'Ivoire active in AIDS are difficult to analyse for lack of access to information. In general, their financial resources are meagre. Many are involved in prevention, mitigation, and curative care. The Association d'Auto-Promotion Sanitaire et Urbaine (ASAPSU) is a prototype of such NGOs. Their expenditures are determined in part by the decisions of local health councils as well as their own staffs. They reimburse for hospital and drug expenses; conduct community-based information, education, and communication activities on a partly volunteer basis; and provide support to families through home visits. At present there are no coordinating mechanisms for NGOs that might facilitate a rationally planned approach and the development of synergies and shared resources.

Employer and insurance payments are determined by the requests of employees and subscribers for reimbursement. Though work-site preventive strategies are potentially effective, there has been little demand for them and little leadership. Employers probably contribute to offset funeral expenses, a form of mitigation, but the extent to which this occurs is unknown.

Notes

1 While this approach identified most government and donor prevention and mitigation activities, it possibly excluded certain regional in-kind contributions. For example, USAID supports the social marketing of Prudence condoms in Côte d'Ivoire as part of a regional programme of social marketing. As neither the NACP nor the Ministry of Health was involved in the financial management of this programme, the NACP did not report any costs for subsidising the sale and marketing.

2 To estimate the breakdown of total health expenditure by use, we assumed that half of the expenditures at the primary level, 10 per cent of expenditures at the secondary level (general hospitals), and none of the expenditures at the tertiary level (university and regional hospital centres) were spent on prevention.

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C. Expenditures on the treatment and prevention of HIV/AIDS in Mexico

By José-Antonio Izazola, Jorge Saavedra, Jeffrey Prottas, and Donald S. Shepard[1]

Section One: Background

With 92 million inhabitants, Mexico is the second most populous country in Latin America, after Brazil. In 1994, Mexico was an upper-middle-income country, with a gross national product per capita of US$4,180. However, the severe financial crisis that began in December 1994 has caused a significant deterioration in the country's economy.

This study presents estimates of the total public and private spending on AIDS prevention and treatment in Mexico and compares the level of subsidy for AIDS treatment with subsidies for curative care in general. The first section provides background on the AIDS epidemic in Mexico and the health care system. The second section discusses the methodology used to estimate costs. The third section presents the expenditure estimates, and we conclude with a discussion of the determinants of these spending patterns.

1.1 AIDS in Mexico

The first AIDS case in Mexico was diagnosed in 1983. By April 1, 1996, there were 26,651 reported AIDS cases throughout Mexico (table 1) and an estimated 100,000 to 150,000 individuals living with HIV who had not been clinically diagnosed with AIDS.

The epidemiological pattern of AIDS in Latin America is different from that observed in other parts of the world, and within this region, the Mexican epidemic seems to have unique characteristics (Valdespino et al 1988; Mann et al 1992). Ninety-five per cent of the cases among men and 45 per cent among women are due to sexual transmission. Among men with sexually acquired AIDS, 60 per cent were classified as homosexuals, 25 per cent as bisexuals, and 15 per cent as heterosexuals. HIV transmission due to injection drug use is negligible in Mexico (2 per cent of reported AIDS cases). While most AIDS cases in Mexico are in gay and bisexual men, heterosexual HIV transmission is increasing. In 1986, there were several outbreaks of HIV infection among

Table 1. Cumulative reported AIDS cases in Mexico, as of April 1, 1996

Mode of transmission	**Cases**	**Per cent**
Sexual, of which:	15,782	59.3
Homosexual	6,213	23.3
Bisexual	4,383	16.5
Heterosexual	5,186	19.5
Blood, of which:	3,104	11.6
Transfusion	2,116	7.9
Haemophilia	250	0.9
Intravenous drug user	377	1.5
Former paid blood donor	353	1.3
Occupational transmission	8	0.0[a]
Perinatal	349	1.3
Undocumented mode	7,416	27.8
Total	26,651	100.0

a. Rounded – exact rate is 0.03 per cent.

Source: The National Council for the Prevention and Control of AIDS (CONASIDA) 1996, unpublished data.

paid plasma donors in private plasmapheresis centers.[2] As a result, the commercialisation of blood was forbidden and universal HIV screening for blood donations has been mandatory in Mexico since 1986.

1.2 The Mexican health care system

The Mexican health care system is complex, as the major insurers are also direct providers of care. Forty-seven per cent of the population is covered by social security institutions, mainly the Mexican Institute of Social Security (IMSS), which provides direct care through a large system of hospitals and clinics. By law the IMSS is the institution in charge of insuring workers of private firms. It finances its facilities through taxes paid into its accounts by government, employers, and employees. The second largest social security institution is the Instituto de Seguridad Social al Servicio de los Trabajadores del Estado (ISSSTE) for federal government employees. Equivalent institutions serve state government employees. Some other health insurance institutions include the official oil monopoly (Pemex), which has its own hospitals, as well as the defense and marine ministries; however, they are just minor players in terms of the percentage of the population covered.

The Ministry of Health (SSA) is responsible for the uninsured poor, who constitute about one-quarter of the population. While operating its own facilities to provide medical care services to this uninsured population, the SSA also serves Mexico as the public health agency responsible for standard public health functions.

Private insurance covers only a small wealthy population and banking workers. In the large fee-for-service private sector, in which care is paid for directly by patients, overall domestic private funding represents 28 per cent of 1995 Mexican health expenditure (based on authors' compilations).

Health care services for HIV/AIDS patients are treated like all other health issues with a single exception: private insurance companies do not cover AIDS-related costs. The Ministry of Health did not, and as of 1998 still does not, fund antiviral therapy for uninsured patients. The social security institutions provide these drugs for a portion of the patients for whom they are responsible. In the course of its research on antiretrovirals (ARV), CONASIDA or the National AIDS Commission, an agency under the SSA, provides ARV treatment for about 100 individuals.

Section Two: Methods

Estimates of AIDS prevention and treatment expenditures were made using official government budgets as well as by interviewing physicians, nongovernmental organisation (NGO) representatives, and top officials in the social security institutions, in major public hospitals, and at CONASIDA. A household survey (ENSA II) was used to estimate private, out-of-pocket expenditures.

Most of the documents used for this study contained 1994 expenditures, the latest available data at the time of this analysis (May 1996). These expenditures were then corrected based on 1995 planned spending increases and were converted to US dollars for comparability. Due to the severe economic crisis that erupted at the end of December 1994, these estimates may not fully reflect changes in public budgets.

2.1 Estimating AIDS prevention expenditures

AIDS prevention expenditures fall into two main areas: the costs associated with blood banks and screening and those with the prevention of the sexual transmission of HIV. For blood bank screening, costs are absorbed mainly by the social security institutions (IMSS and ISSSTE) and by the Ministry of Health. We examined their budgets as well as Red Cross expenditures. CONASIDA does most of the screening for AIDS in the public sector.

The public activities for blood testing involve protecting the blood supply with tests run prior to the use of transfusable blood. Employer expenditures reflect the costs of testing employees to detect HIV, often to terminate their employment. While employers may consider this expense 'preventive', in the sense that it could prevent some HIV transmission among coworkers, it is not a valid preventive expense, as HIV is not spread by casual contact.

Government expenditures for the prevention of sexually transmitted HIV were estimated using government budget figures in the CONASIDA budget. CONASIDA is the primary AIDS-related agency in Mexico, charged with oversight, coordination, and prevention. It granted exceptional access to its official budget for the purpose of this study. No significant government programs in AIDS prevention operate in other parts of the Ministry of Health. We interviewed the director and key employees of CONASIDA to help ensure a clear understanding of the budget.

Nongovernment organisations also provide important AIDS prevention services in the larger cities. Estimating the costs of these services is difficult because volunteers are often used, the number of patients is hard to track, and patients may seek services from government sources while also getting services from NGOs. Because no official publication inventories the NGOs' contribution to AIDS prevention expenditures, we held a workshop with seven of the most active NGOs in order to estimate their expenditures. We distributed the workshop participants' data on total expenditures across spending categories and used the data to extrapolate to the eight other most active NGOs not present at the workshop. Together, these 15 NGOs represent the bulk of the funds NGOs spend in Mexico. Some NGOs also offer treatment services, and we estimated their expenditures in the same manner. International organisations' expenditures were estimated after a telephone survey of major donors.

Condom expenditure is based on a study of total condom sales nationwide. Condoms are not a significant part of the family planning effort in Mexico, so we assumed that all sales were essentially for disease prevention.

2.2 Estimating AIDS treatment expenditures

Expenditures on AIDS treatment are embedded in the health care budgets of all public provider and insurer systems. The following steps were taken to estimate AIDS treatment expenditures.

1. Clinicians who care for large proportions of AIDS patients developed typical treatment patterns for specific types of patients.
2. The cost of each treatment pattern was estimated using the average costs for each service, such as a hospital day, medications, a physician visit, laboratory tests, and so on.
3. The total cost for a typical treatment pattern was multiplied by the number of patients in that category.

Physician workshop. Through Delphi panels with clinicians, we obtained the standard treatment patterns for various kinds of AIDS patients in different public institutions as well as in the private sector. This research provided per case costs, which were then translated into total costs in those sectors for which direct budget information was not available. Six physicians who were very knowledgeable about and involved in AIDS treatment were invited to attend a workshop to discuss typical treatment patterns for their patients. Physicians from the major government health systems were chosen because more than half of all Mexican citizens receive health care in one of these systems. In addition, these physicians also care for 'private' patients who pay for their services. The tendency of physicians to describe ideal rather than actual treatment patterns cannot be discounted, although repeated efforts were made to sensitise respondents to that danger. They were asked to provide information regarding the representativeness of the patterns they reported; however, they probably still somewhat overestimated the average quantity of care being provided nationwide. The most notable result may be in the high percentages of total costs that drugs represent.

Estimations of the number of AIDS patients by category. Because AIDS patients in Mexico are not identified as such until they experience a 'precipitating medical event', this number is an underestimate. These official numbers were therefore corrected for the delay in reporting AIDS deaths and for underreporting, based on an examination of hospital records in a small sample. These corrections raised the number of estimated AIDS sufferers living in Mexico during 1995 to about 15,808, the figure used in this study. The larger cumulative number in table 1 – 26,651 – includes deceased patients as well. More sophisticated ongoing work now, with the correction of death certificates and backward calculation methods, suggests that this estimate is reasonable.

Each of these data elements was obtained separately for different categories of patients – those in the social security system, those served by the Ministry of Health, and those who are treated privately, either the wealthy, who seek supplemental care, or the poor, who obtain care on a charity basis. The number of IMSS and ISSSTE systems' AIDS patients was estimated using Ministry of Health sources. Data on the number of AIDS patients being served by social insurance institutions were accepted as accurate, and the difference between that total and the total number of AIDS cases was assumed to be the uninsured and those in the care of private providers. Fifty-nine per cent of AIDS patients received publicly provided care (30 per cent directly and 29 per cent through social security), 27 per cent received private care, and 14 per cent received care from NGOs.

Drug expenditure. Drug expenditure was estimated differently for the uninsured based on the assumption that those poor patients not covered by a public provider system purchased only a portion of the drugs prescribed. This assumption is sound, although the actual percentage of drugs purchased has little empirical support. The figures for ARV drugs were cross-checked with data on the amount and cost of these medications that were purchased by the IMSS system, and the match was close. However, we can not assume that the same is true for the uninsured population, because private providers do not offer free drugs; their patients must pay for them.

2.3 Total health treatment expenditures

Total public expenditures on health care (treatment) were derived from previous studies of FUNSALUD (Fundación para la Salud, or Foundation for Health), using household surveys and budget allocations (Hernandez-Peña et al 1998). We used the federal budget, which divides most expenditures among prevention, treatment, and mitigation. Other expense categories were treated as indirect costs and allocated to the former categories according to their most likely orientation. State governments' contributions were estimated, based on prior year data, to be 16 per cent of federal expenditures, and the government's total expenditures were increased by this percentage in all categories. Overall, Mexican health expenditure in 1995 was US$8.4 billion at market exchange rates (table 2), the equivalent of about 5 per cent of GNP and US$200 per capita.

Table 2. Total health expenditure by type and source of funding, Mexico, 1995 (millions of US dollars)

	Source of funds			Total	
Use of funds	**Public**	**Private**	**International**	**Amount**	**Per cent**
Prevention	579	175	58	812	9.7
Treatment	5,331	1,730	29	7,090	84.5
Mitigation	485	0	0	485	5.8
Total	6,394	1,905	87	8,387	100.0
(Per cent)	(76.2)	(22.7)	(1.0)	(100.0)	

Note: Rows and columns may not sum to totals due to rounding.
Source: Hernandez-Peña et al 1998; authors' calculations.

Section Three: Results

Mexico spent US$79.1 million on AIDS-related health care and prevention in 1995, or about 1 per cent of its total (private and public) health expenditures (table 3). For an estimated 15,800 people with AIDS, this expenditure seems a very heavy burden. About 63 per cent of total AIDS costs went directly to treatment.

Table 3. Estimated HIV/AIDS expenditures by use and source of funding, Mexico, 1995 (millions of US dollars)

	Source of funds			Total	
Use of funds	**Public**	**Private**	**International**	**Amount**	**Per cent**
Prevention	16.6	11.9	0.9	29.4	37.2
Treatment	24.0	25.4	0.0	49.4	62.5
Mitigation	0.2	0.0	0.0	0.2	0.2
Total	40.8	37.3	0.9	79.0	100.0
(Per cent)	(51.6)	(47.2)	(1.1)	(100.0)	

Note: Rows and columns may not sum to totals due to rounding.
Source: Hernandez-Peña et al 1998; authors' calculations.

3.1 AIDS prevention expenditures

The largest component of prevention, about US$16.4 million, is dedicated to preventing AIDS through blood transfusions (table 4). Although it is clearly an

Table 4. Estimated HIV/AIDS prevention expenditures by use and source of funding, Mexico, 1995 (millions of US dollars)

	Use of funds			Total	
Source of funds	**IEC**[a]	**Blood bank**	**Condoms**	**Amount**	**Per cent**
Public					
Direct government	2.3	5.5	0.0	7.8	26
Social security	3.2	5.5	0.0	8.8	30
Private					
Employers	3.2[b]	0.0	0.0	3.2	11
Households	0.3	0.0	2.6	2.9	10
Private insurance	0.0	0.0	0.0	0.0	0
NGOs	0.5	5.3	0.0	5.8	20
International	0.8	0.0	0.1	0.9	3
Total	10.3	16.3	2.7	29.4	100
(Per cent)	(35)	(56)	(9)	(100)	

a. IEC: information, education, communication.

b. Primarily employers' screening of workers and job applicants for HIV.

Source: Authors' compilations.

AIDS-driven cost, it is unlikely to be effective in stemming Mexico's epidemic, which is largely based on sexual transmission.

The amount spent on screening by blood banks is partly related to a Mexican law that requires every blood donor be tested for HIV. On 'national blood donor days' organized by the Red Cross, large amounts of blood are collected and also tested for HIV. However, due to expiration and a variety of other reasons, large proportions of these packages are never used for transfusion. Therefore, the blood screening costs in Mexico exceed those strictly imposed by the necessity to ensure a safe blood supply.

When blood screening costs are excluded, very few public resources are dedicated to prevention efforts aimed at changing sexual behavior in Mexico – US$5.5 million, or only 13 per cent of total public AIDS expenditure for prevention and treatment (US$40.8 million, as shown in table 3). This amount represents just 1 per cent of total public expenditures on prevention overall (see table 2). In addition, international agencies and Mexican NGOs provide US$1.3 million toward AIDS prevention.

Family planning programs with condom distribution also may have an AIDS prevention component. However, the Mexican family planning program's strategies make it very difficult to assign any part of its costs to AIDS prevention, especially as the government did not buy condoms specifically for AIDS prevention during 1995. Based on information on condom sales, we conclude that most of the condom-based prevention measures are funded either by out-of-pocket expenditures by households or private sources and by international donors.

3.2 AIDS treatment expenditures

There are two striking features concerning the data on treatment costs (table 5). First is the importance of drugs, which represent two-thirds of total treatment costs. Forty-one per cent of treatment costs are attributable to ARV drugs (primarily mono- and bi-therapy) and an additional 26 per cent are spent on other drugs. These facts reflect both the importance of medication in AIDS treatment and the relatively high cost of drugs when compared to the costs of other clinical inputs in Mexico. AIDS treatment is increasingly being conducted on an ambulatory basis in Mexico, resulting in the relatively low percentage of treatment costs in the hospitalisation column in table 5. In general, this trend can be seen as desirable, although it may raise some quality-of-care issues.

Table 5. Estimated treatment expenditures for HIV/AIDS by type of treatment and source of funding, Mexico, 1995 (millions of US dollars)

	Use of funds					Total	
Source of funds	Hospitalisation	Clinic visits	Anti-retroviral drugs	Other drugs	Laboratory tests	Amount	Per cent
Public							
Government	0.5	0.2	0.2	1.2	1.8	3.9	8
Social security	4.3	0.4	9.7	4.2	1.5	20.1	41
Private							
Households	1.5	0.9	10.6	7.3	4.8	25.2	51
NGOs	0.0	0.2	0.0	0.0	0.0	0.2	<1
Total	6.3	1.7	20.5	12.7	8.1	49.4	100
(Per cent)	(13)	(3)	(41)	(26)	(16)	(100)	

Source: Authors' compilations.

The second striking point is the large burden of treatment costs being borne by individuals. Only about one-third (35 per cent) of AIDS sufferers are being cared for by public institutions. The 65 per cent who must partially or totally pay for their own care actually spend, in aggregate, more money than does the public sector. NGO contributions to paid treatment costs are negligible. (Their contribution via voluntary services is much greater and is not, we recognise, quite reflected in these numbers.) The per person costs of care for the out-of-pocket (private, NGO, or uninsured) group are much lower than those in the public system, primarily reflecting less care.

3.3 Expenditure on mitigating the impact of AIDS

Mitigation costs, narrowly defined, are virtually zero because of the structure of the disability system and the short post-diagnosis life expectancy of AIDS patients. Disability payments under social security in Mexico are very low (about US$100 per month) and not available for the first six months of disability. Only 47 per cent of the population are covered by this social security system and only a smaller proportion of AIDS patients are so covered (about 35 per cent). Average post-diagnosis survival is estimated at about 18 months. Even if disability status and diagnosis occur at the same time this benefit would mean only about US$900 paid to an individual. In addition, it should be noted that private life insurance does not pay if the insured's cause of death was AIDS.

Section Four: Determinants of expenditure patterns

The public sector dominates expenditure on AIDS prevention in Mexico. At first glance, public expenditure on prevention seems relatively high in relation to total public expenditure on AIDS – 41 per cent. However, more than two-thirds of public expenditure on prevention was for screening of blood banks; protecting the health system against AIDS is essential but not likely to be effective in stemming the sexual transmission of AIDS, which is fueling the epidemic in Mexico. Furthermore, even the small remainder of public funds devoted to the prevention of sexual transmission – only US$0.06 per capita – probably overstates what is actually spent by the public sector, since screening could not be separately identified in the CONASIDA budget and these expenditures were attributed to IEC.

The predominance of blood screening costs reflects the unit cost of testing blood and the immense scale of the medical use of blood in Mexico, as contrasted to the relatively tiny scale of the AIDS epidemic in Mexico. The nonpublic blood screening costs are the result of certain large employers testing their work force. As mentioned, employers think of this activity as preventive, but it has little or no public health utility.

The cost of condoms is solely in the private sector as condoms are little used in family planning in Mexico, and such family planning efforts are not aimed at the population at high risk for HIV. The large increase in these purchases coincident with the public's awareness of AIDS suggests that fear of AIDS is, at least, a factor in their rising sales.

The treatment costs and their distribution are primarily functions of the numbers of people living with AIDS and the structure of the Mexican health system. The level of public subsidy for AIDS treatment (49 per cent) is substantially lower than the overall subsidy for curative care in Mexico (75 per cent). The reasons for this difference are the social security systems, a major funder for AIDS treatment, have sought to minimise their payments for AIDS care. For example, one social security institute delayed the government's approval of AZT in Mexico to postpone its obligation to pay for the treatment. Another example is that ARV treatment was and still is not generally available for asymptomatic individuals but only for those with full-blown AIDS. Third, in 1995, for a patient to get ARV treatment, he or she had to be publicly identified as HIV-positive. Even then, there was no assurance a patient would receive ARV treatment. These conditions reduced the desire of patients with HIV to seek treatment in the public sector. (By 1998, however, this discrimination has abated.) A final reason for low public coverage is the generally limited public coverage of expensive drug treatments for AIDS compared to other serious conditions, such as cancer.

Notes

1 The authors are grateful to Lisa Leroy for assistance in planning the workshops, to the participants at all workshops, and to others who supplied data and advice for this study.

2 There were centers in which individuals were paid for providing a package of blood. This package was centrifuged, cells were extracted from it, and plasma was returned to the paid donors. It is assumed that these centres reused needles and other materials that enhanced HIV, hepatitis B, and hepatitis C transmission from one donor to the other.

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D. Expenditures on HIV/AIDS in the state of São Paulo, Brazil

by Roberto Iunes, Antonio C.C. Campino, Jeffrey Prottas, and Donald S. Shepard

Section One: Introduction and background

São Paulo is the richest and most populous state in Brazil. About one-fifth (33 million) of the country's population of 155.8 million reside in São Paulo state. Its per capita gross domestic product (GDP) (US$7,574) is 72 per cent higher than the national GDP per capita (US$4,393). Thus, more than one-third (36.6 per cent) of Brazil's GDP originates from the state (IBGE, various issues; FGV, various issues; World Bank 1997). It has also accounted for more than half of all of the reported AIDS cases to date in Brazil.

This study estimates total public and private expenditures on AIDS treatment and prevention in São Paulo state, by the source of financing and the type of programme. The first section provides background on the AIDS epidemic and the Brazilian health care system. The second section explains the methodology and results for estimates of individual components of AIDS expenditure in São Paulo state. In the third and final section we compare the level of public subsidy for AIDS with that for all health programmes.

1.1 The AIDS epidemic in Brazil

Between 1980, when the first AIDS case was diagnosed, and early March 1996, there were 79,908 cases of AIDS reported in Brazil. Of this total, 43,184 cases (54 per cent) occurred in the state of São Paulo. About 30 per cent of AIDS cases go unreported, and there is often a substantial delay in between diagnosis and official notification.

Of the cumulative number of cases reported for the country, 81.8 per cent are in males. However, the proportion of female cases has been increasing: women represented 18.7 per cent of new cases in 1992, 21.5 per cent of new cases in 1993, 22.4 per cent in 1994, and 24.8 per cent in 1995–96. Heterosexual transmission has been on the rise, accounting for 6.4 per cent of all reported AIDS cases in 1989 and 28 per cent in 1995–96. The share of cases transmitted via injecting drug use increased from 13 per cent to 23 per cent transmitted via injecting drug use increased from 13 per cent to 23 per cent during approximately the same period.

Both the number of AIDS cases and the incidence rates have increased between 1990 and 1993 in the country as a whole and in São Paulo. In 1993, 7,460 new cases were reported in São Paulo (incidence of 23.0 per 100,000) compared to 13,792 new cases in Brazil (incidence of 9.2 per 100,000) (table 1).[1] By the end of 1995 there were approximately 36,000 persons with AIDS (PWA) alive in Brazil and 19,000 in São Paulo state, and roughly 700,000 individuals were infected with HIV in the country.

Table 1. Number of AIDS cases reported and annual incidence rates (per 100,000) by year of diagnosis

	Brazil		São Paulo state	
Year of diagnosis	AIDS cases	Incidence rate	AIDS cases	Incidence rate
1990	7,683	5.2	4,393	13.3
1991	10,265	7.0	5,762	18.3
1992	12,515	8.4	7,070	21.8
1993	13,792	9.2	7,460	23.0
1994	13,595	8.9	6,941	21.0

Source: Ministry of Health, National Programme on STD/AIDS, various issues.

1.2 The Brazilian health care system

The Brazilian national health system and its legal existence are founded on the principles of public financing, universal access, free care, and full coverage. This public system is known as SUS (acronym for Sistema Único de Saúde or Unified Health System) and finances the care of approximately 75 per cent of Brazilians. SUS provides some care directly and also finances substantial amounts of care by nongovernmental providers, both nonprofit and for profit. As the quality of care provided through SUS is generally not seen as very good, wealthier people and those with jobs that provide insurance coverage usually have access to better facilities and services.

Within SUS, the reimbursement of services is primarily the responsibility of the federal government, which prospectively defines the reimbursement rates and transfers resources directly to providers.[2] The federal government devotes 55 per cent of its expenditures to curative services.

The pure private market includes the care provided or financed by third-party agents like health insurance companies, health maintenance organisations (HMOs), cooperative systems, and so on. Employers and individuals purchase these services, which will be referred to in this text as medical or health plans. About 40 million Brazilians (nearly 25 per cent of the population) have some type of private coverage.[3] Total public and private health expenditures amounted to US$29.9 billion in 1995, or 4.37 per cent of GDP (table 2).

Table 2. Public and private health expenditures, Brazil, 1995

Source of financing	Expenditure (US$ billion)	Per cent	Per capita (US$)
Public, of which:	19.9	66.56	129.23
Federal	16.1	53.85	104.55
Cities and states[a]	3.8	12.71	24.68
Private[b]	10.0	33.44	250.00
Total	29.9	100.00	194.16

a. Health expenditures incurred by states and cities are not known in Brazil. This estimate is the working figure used by government agencies and is based on a study done in the late 1980s. It is believed, and the authors agree, that this amount underestimates actual expenditure.

b. Private expenditures are revenues received by third-party companies operating with health care. They exclude out-of-pocket expenditures. The private per capita figures are for the covered population.

Source: Ministry of Health, various issues; Instituto de Economia Aplicada (IPEA) 1994, 1995; Associaçao Brasileira das Medicinas de Grupo (ABRAMGE) 1995.

Structural inconsistencies in financing SUS and the general crisis of the public sector have severely limited the government's ability to provide and finance health care services, further affecting the quality and quantity of the services offered by the system. As a result, workers have increased pressure on their employers for company-financed medical benefits, the private health care market has expanded, and some of the better providers have terminated their contracts with the government. Thus, those individuals who depend on SUS have been left with fewer services and a generally lower quality of care. SUS is responsible for the vast majority of medical services being performed in the country: in 1993 it paid for 77.5–83.5 per cent of all hospital admissions in the country (Iunes 1995). As will be shown, this proportion is significantly higher in the case of AIDS.

Imp.

In São Paulo state, public and private health expenditure amounted to about US$7.6 billion, or 3.03 per cent of the state's GDP, of which 54 per cent was publicly financed (table 3).

Table 3. Estimates of public and private health expenditures, São Paulo state, 1995

Source of financing	Expenditure (US$ billion)	Per cent	Per capita (US$)
Public, of which:	4.1	53.96	124.2
Transfers from federal level	2.0	26.32	60.6
State	1.3	17.11	39.4
Cities	0.8	10.53	24.2
Private	3.5	46.04	303.0
Total health	7.6	100.00	230.3

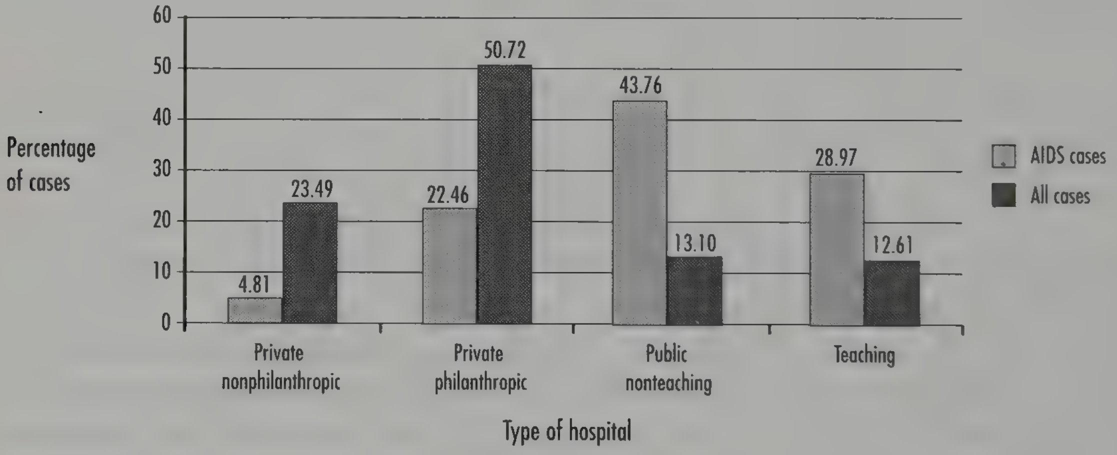
Source: Ministry of Health, various issues; authors' estimates.

Section Two: Estimating expenditures on AIDS

2.1 Hospital expenditures

Public medical facilities provide a disproportionate share of AIDS hospitalisations. Overall, nearly three-quarters (73 per cent) of AIDS patients are treated in public facilities (public nonteaching hospitals and teaching/research hospitals[4]), but only about one-quarter (26 per cent) of all hospitalisations take place in public hospitals (figure 1). As we shall see, this divergence is largely explained by the refusal of most private institutions to provide or finance care for AIDS patients.

Figure 1. Distribution of hospital admissions financed by SUS, by type of hospital and type of admission, São Paulo state, 1994



Source: Datasus 1995.

Public sector: SUS

The Ministry of Health distributes monthly data on public sector hospital expenditures for public use on CD-ROM. These data, while rich, must be viewed with caution. First, they represent reimbursements made by the government to private and public hospitals, not the total costs incurred by providers. Second, fraud is widespread, largely due to the low reimbursement rates set by the government. The most commonly observed forms of fraud are submitting bills for 'ghost' patients, billing for procedures or drugs and materials not consumed, and shifting the diagnosis or procedure to fit more severe cases. Finally, some public hospitals may not submit their bills or may not present a detailed account of all expenditure items. It is not known if all these problems are present in the AIDS-related data, but fraud may not be as significant a concern for AIDS hospitalisations because it is a recently established reimbursement category, it is relatively expensive, and the number of cases is not very large relative to all hospitalisations.

Table 4 shows data for hospitalisations for all causes and for AIDS in Brazil and the state of São Paulo in 1994. As expected, the share of AIDS-related hospitalisations is much greater in São Paulo than in the country as whole.

- SUS paid for about 15.4 million hospitalisations in the country, of which 3.4 million (21.8 per cent) were in São Paulo. AIDS hospitalisations represented about 0.2 per cent of all hospitalisations paid for by SUS in the entire country and almost 0.5 per cent in São Paulo state.
- AIDS-related hospitalisations are significantly longer than the average case: 10.8 days compared to 6.6 days, respectively, in São Paulo and 13 days compared to 6.1 days, respectively, for all of Brazil.
- Hospitalisations for AIDS are also more expensive per day, by about 26–28 per cent. Each day of hospitalisation for AIDS costs SUS about US$51 in São Paulo and US$47 for all of Brazil, compared to US$40 and US$37 per day in the two areas for all hospitalisations.
- As a result of the longer stay and higher cost per day, AIDS hospitalisations cost the government more than twice as much as the average hospital stay. In São Paulo state, for example, the average hospitalisation for AIDS cost US$549, more than twice the average cost for all hospitalisations (US$261).
- AIDS accounted for 1 per cent of all hospital expenditure by SUS in São Paulo state and half that percentage for the entire country.

However, as noted above, SUS reimbursements may substantially understate the costs of providing the services. To estimate the extent of this problem, we compared the total costs of hospitalisation of 10 randomly selected

Table 4. Hospitalisations financed by SUS, by cause, in São Paulo state and Brazil, 1994

Item	All causes	AIDS	AIDS/All causes (%)
São Paulo state			
Admissions (000)	3,355,878	15,907	0.47
Hospital days	22,136,371	171,722	0.78
Average length of stay (days)	6.6	10.8	164
Total expenditure (US$ 000)	876,698	8,726	1.00
Expenditure per admission (US$)	261	549	210
Brazil			
Admissions	15,367,326	29,221	0.19
Hospital days	93,858,552	379,795	0.40
Average length of stay (days)	6.1	13.0	213
Total expenditure (US$ 000)	3,479,147	17,803	0.51
Expenditure per admission (US$)	226	609	269

Source: Datasus 1995.

AIDS patients, based on 1995–96 patient records obtained from a philanthropic hospital in São Paulo, with SUS reimbursements.[5] According to these records, the average cost per hospital admission was US$4,397, while the average payment by SUS in 1995 was US$631. The cost per day of hospital care was US$332, compared to the US$57 average daily SUS reimbursement. This analysis is corroborated by an earlier study (Médici and Beltrão 1991) that found a daily cost of AIDS hospitalisation of US$360. So the cost per day of hospital care for AIDS patients is about 5.9 times greater than the amount paid by SUS. This difference is actually very close to the 6:1 cost to reimbursement ratio reported to us by the director of the largest hospital involved in the treatment AIDS patients. We therefore estimate that the total cost of AIDS-related hospitalisations in São Paulo state was US$59.4 million, compared to US$10.1 million reimbursed by SUS in 1995.

Who paid for the US$49.3 million difference between total costs and SUS payments? We have several hypotheses:

- Some hospitals transfer this burden to their private patients covered by medical plans, which means that private patients are cross-subsidising SUS patients. However, few of the hospitals that receive AIDS patients from SUS also provide services to private patients, and it is doubtful that hospitals would be able to extract an additional volume of resources that is large enough to cover all excess costs.
- Hospitals may be overcharging the system for other procedures.
- Some hospitals may be partially covering the extra costs with their own resources. Such an assumption can only hold for philanthropic and public hospitals. In the case of public hospitals this implies that the public sector is actually paying through other means, such as bigger hospital budgets, what it does not pay through the reimbursement rates.[6] In the case of philanthropic hospitals it can be safely assumed that the proportion of the extra costs assumed by these institutions is not very large, for they have been facing financial difficulties for quite some time.[7]

We considered four separate sets of assumptions regarding the financing of the difference between the total costs of the services and SUS payments, and present here the results of the most likely scenario. Among the 22 per cent of patients that are treated in philanthropic hospitals, we assume that the hospitals themselves bear 20 per cent of the excess cost, 30 per cent is transferred to private insurance companies, and 50 per cent is paid for by the government. The for-profit hospitals do not bear any extra cost, transferring 30 per cent to private plans and 70 per cent to the government.[8]

The sources of finance for AIDS hospitalisations by SUS under these assumptions are shown in table 5. The public sector finances US$53

Table 5. Sources of financing for SUS AIDS hospitalisations, state of São Paulo, 1995

Source	1995 US$	Per cent
Government	53,151,692	89.49
Private plans	4,030,053	6.78
Nonprofit hospitals	2,212,797	3.73
For-profit hospitals	0	0
Total	59,394,542	100.00

Source: Datasus 1995; authors' estimates.

million of the cost of SUS AIDS hospitalisations, or 89 per cent of the total. Nonprofit hospitals assume 3.7 per cent of the cost, and private plans, 6.8 per cent. It is generally expected that for-profit hospitals will make every effort to shift any extra cost to third parties, so these hospitals do not assume any burden.

Private medical plans

Most private medical plans in Brazil do not cover AIDS.[9] However, this position has been recently questioned in courts, and consumers have generally obtained a positive ruling. Data on AIDS expenditures by private third-party payers are not readily available. A study commissioned by one company estimated an expected annual cost of US$22,000 per AIDS case.

Since it is not known how much of each hospitalisation was paid for by these private companies, we have assumed that they paid for 4 per cent of the number of AIDS-related hospitalisations funded by SUS in São Paulo in 1995. This assumption implies a hospitalisation rate (per population covered) that is 9.4 per cent of the one observed for SUS and that private plans would have paid for 642 AIDS admissions in 1995 in São Paulo, costing US$14,126,640. Including the possible cross-subsidy to SUS patients, the total expenditures of the private sector for AIDS-related hospital cases in the state of São Paulo in 1995 was US$20.4 million.

Total hospital costs

We estimate that the expenditure incurred in providing hospital care within SUS (US$59 million) is almost 81 per cent of total hospital expenditures for AIDS care (US$73.5 million) (table 6). The public sector spends a little more than US$53 million, thus financing 72 per cent of the hospital care, and the private sector finances the remaining 28 per cent (19 per cent of total care), or about US$14 million.

Table 6. Financing of hospital services for AIDS patients, state of São Paulo, 1995, by provider and source of finance (US$)

	Provider		
Source of finance	SUS	Private	Total
Public	53,151,692	–	53,151,692
(%)	(89.5)		(72.3)
Private, of which:	6,242,850	14,126,640	20,369,490
(%)	(10.5)	(100.0)	(27.7)
Providers	2,212,797	–	2,212,797
(%)	(3.7)		(3.0)
Plans	4,030,053	14,126,640	18,156,693
(%)	(6.8)	(100.0)	(24.7)
Total	59,394,542	14,126,640	73,521,182
	(100.0)	(100.0)	(100.0)

– Zero.

Source: Datasus 1995; authors' estimates.

2.2 Outpatient care: Day hospitals

The development of the so-called day hospital ('hospital dia') in Brazil, a facility in which patients typically stay for several hours and receive medication, food, and care, is considered a blessing by many physicians. This form of ambulatory treatment has replaced much of the traditional individual office visits within SUS and is being adopted by many physicians in their private practices.

This type of service has several advantages. The day hospital provides some economies of scale, particularly for the professionals, who can see several patients, and partially compensates for the low wages or rates received. By replacing the extremely brief and not very efficacious office visit, it may actually also improve the quality of care. It reduces the overall cost of AIDS treatment by reducing the number of inpatient admissions. In fact, according to some physicians, the use of day hospitals has allowed more patients to afford a better quality of private care, which also reduces the pressure on SUS. Finally, this form of ambulatory care also decreases the demand for hospital beds, the lack of which is a major problem faced by SUS. It is estimated that there are about 215 beds in day hospitals in the state of São Paulo.

Unfortunately, the data available on outpatient care only refers to SUS patients. The cost estimate of the services provided in day hospitals was calculated from a three-month sample obtained from one facility. The result indicates a per patient daily cost of US$81 (each bed is used more than once per day and usually twice), or 24.5 per cent of the cost of a day in the hospital, and translates into US$9.2 million in total expenditures in 1995.[10]

2.3 Drugs

The government is the major supplier of AIDS drugs, which are available at public facilities without any charge to patients. With respect to antiretroviral (ARV) drugs, it supplies AZT, ddC, and ddI. However, the public sector's capacity to buy and distribute the drugs is limited for both the ARV drugs and those used against opportunistic infections. The state's Department of Health estimates that the supply of drugs available in the state in 1995 was only enough to cover 8,000 of the 19,000 patients who needed medication.

The estimate of drug expenditures here is based on work done at the state's Department of Health and at the Federal University of São Paulo. Table 7 describes the volume and cost of ARV drugs ideally needed for the 8,000 patients covered for a total of US$31.7 million. In 1995 this array did not include 3TC and protease inhibitors. Had they been offered, the total cost would have been US$54.6 million, including US$5.6 million for 3TC and US$17.3 million for protease inhibitors.

Table 7. Public expenditures on antiretroviral drugs, state of São Paulo, 1995

Drug	Patients per year	Capsules per patient per year	Unit cost (US$)	Cost per patient per year (US$)	Total annual cost (US$)
AZT					
100% 600mg/day	8,000	2,190	0.52	1,139.14	9,113,134
2.5% oral 10mg/ml	200	60	27.09	40.64	325,098
2.5% IV	200	27	102.95	69.49	555,917
Didanosina (ddI)					
60% 400 mg/day	4,800	1,460	1.90	1,661.25	13,289,987
40% 250 mg/day					
(100 mg)	3,200	730	1.90	553.75	4,429,996
(25 mg)	3,200	730	0.48	139.23	1,113,828
Zalcitabina (ddC)					
20% 2.25 mg/day	1,600	1,095	1.65	360.73	2,885,826
Total				3,964.23	31,713,786

Sources: State Department of Health and Federal University of São Paulo.

In addition to antiretroviral drugs, a total of US$7.4 million was spent on drugs for treating opportunistic illnesses in 1995, of which US$5.9 million was distributed by the federal government and US$1.5 million by the state (State Department of Health and Federal University of São Paulo).

The combined public expenditure on ARV and other drugs was US$39 million in 1995. The number of private individuals who can afford these drugs is very limited. We assumed that 5 per cent of the 19,000 AIDS patients who need medication purchase all the ARV drugs and the drugs for the opportunistic infections directly from the market and that another 2 per cent of the patients can afford all of the drugs (that is, all ARV drugs, the medications for opportunistic infections, and the high-cost drugs).[11] This estimate implies private spending of US$9.6 million on drugs for São Paulo state in 1995.

A few months after this study was completed, the Brazilian Congress passed a law that requires the government to supply, free and independently of the person's income, all drugs necessary to the treatment of AIDS, including the so-called cocktail of protease inhibitors. At that time (the end of 1996) it was estimated that the annual drug provisions would cost the government US$40 million. By November of 1997 the actual cost had actually reached ten times that much, or US$400 million, which is about 2 per cent of the Ministry of Health's budget. The government estimates that this cost will increase to US$700 million in 1998, or about 4 per cent of the ministry's proposed budget.

2.4 Other curative expenditures

São Paulo received US$250 million from the AIDS project financed by the World Bank. The transfer of resources from the federal level, which is responsible for the general management of the project, began in March 1994. Among the components of the project being developed in the state of São Paulo, US$2.4 million was spent on services and institutional strengthening (training and equipment for laboratories), of which 15.2 per cent were national resources.

2.5 Information and education

The data obtained on expenditures for information and education are still extremely limited. We could only locate one item (within the transfers made to the state through the World Bank project), and that amounted to a little more than US$500,000 in 1995, with 85 per cent from international sources.

This amount is clearly a gross underestimate of the resources being allocated to these activities. In 1995 the National AIDS programme coordinated information and education projects in all 27 states, with an overall estimated expenditure of US$950,000. Eight were directed to sex workers (US$270,000), eight to homosexuals (US$260,000), nine to prisoners (US$340,000), and two to miners in the Amazon region (US$83,000). It also conducted 11 national campaigns, including both electronic and nonelectronic media (outdoors, posters, folders, and so on).

Even though Brazil has legislation that mandates AIDS education in the workplace, compliance with the law is rare and companies have received little support in designing and implementing their programmes. The national AIDS programme has put much effort into improving and increasing its relationship with companies, and as a result the firms' involvement has grown substantially (some are even distributing medication to their infected employees). Hard figures are still very scant, however.

2.6 Blood screening

There were approximately 840,000 blood donations in the state of São Paulo in 1995. Each blood donation in the state is tested for the presence of HIV. Unfortunately, there is no single institution that has assembled all of the cost information. Some institutions test their own blood, others contract private laboratories to do the testing, and others use the resources of the Fundação Hemocentro, the largest blood bank in the state. The figures presented are based on data collected from one hospital and from interviews with specialists.

The types of tests performed vary according to whether a sophisticated private hospital or public facilities are performing them. The former usually run two Elisa tests in parallel, but some are using new tests, such as the P24 (which costs US$7 each), and even experimental tests, such as the PCR (costing US$100). The general rule, however, is to use one Elisa test and the Western Blot test for confirmation. Since there are so many different types of institutions performing tests, it was impossible to obtain an estimate of their indirect costs. We have used the general rule of thumb of doubling the cost of the unit test to incorporate some of these other costs. Each Elisa kit with 100 tests costs approximately US$175. Since in every kit five or six tests must be left unused, the unit cost increases to about US$1.85. Thus, it is assumed that each test costs US$3.70 overall.

In Brazil more than 90 per cent of blood donations are from first-time donors. About 0.2 per cent of the Elisa tests produce a positive result, and 0.08 per cent are confirmed by the Western Blot. If a test is confirmed as positive the individual is called for an interview and counselling; however, many blood banks lack the capacity to perform this task. The total 1995 expenditure was US$3.2 million.

2.7 Condom distribution

According to officials from the Department of Health, São Paulo state spent about US$1.5 million on condom distribution in 1994–95. We have not been able to obtain information on expenditures incurred by the federal level or by cities. In 1991, 45.3 million condoms were sold in the entire country. If this figure is projected to 50 million in 1995, and, assuming that roughly 35 per cent of this total were sold in São Paulo, the state's market for condoms would represent something like US$17.5 million (using US$1 as the average cost of a condom).

2.8 Other preventive expenditures

Approximately US$1.9 million was spent in 1995 for HIV surveillance in the state of São Paulo, 96 per cent of which was funded by the World Bank and other international resources.

2.9 Summary

The total expenditure for AIDS in São Paulo state reached almost US$158 million in 1995 (table 8). Only US$24 million (or 15 per cent) was used for prevention; the remaining US$134 million (85 per cent) was spent on curative measures. The public sector spent approximately US$102.5 million (65 per cent); private agents, US$47 million (30 per cent); and the resources from the World Bank project amounted to US$4.6 million (3 per cent). The US$3.2 million (2 per cent of the total) spent on blood tests could not be divided among the different sources of funds. About US$27 million (17 per cent of total expenditures) was out-of-pocket expenditures by households and individuals, including US$17.5 million in condom purchases and US$9.5 million on drugs.

Table 8. Summary table of expenditures, state of São Paulo, values in thousands of 1995 US$

	Public				Private						
	Federal	State	Un-defined	Total	Providers	House-holds	Insurance	Total	Inter-national	Un-defined	Total
Prevention											
Information	78	–	–	78	–	–	–	0	437	–	516
Blood screening	–	–	–	0	–	–	–	0	–	3,157	3,157
Condom distr.	–	759	–	759	–	17,500	–	17,500	–	–	18,259
Other	9	–	–	9	–	–	–	0	1,937	–	1,946
Total prevention	87	759	0	846	0	17,500	0	17,500	2,374	3,157	23,878
Treatment											
Hospital	53,152	–	–	53,152	2,213	–	18,157	20,370	–	–	73,521
Day-hospital	–	–	9,228	9,228	–	–	–	0	–	–	9,228
Drugs											
Antiviral	28,828	2,886	–	3,714	–	–	–	0	–	–	31,714
Other	5,851	1,508	–	7,358	–	–	–	0	–	–	7,358
Total drugs	34,679	4,394	–	39,072	–	9,564[a]	–	9,564	–	–	48,636
Other	193	–	–	193	–	–	–	0	2,229	–	2,422
Tests	–	–	–	0	–	–	–	0	–	–	0
Total treatment	88,024	4,394	9,228	101,645	2,213	9,564	18,157	29,934	2,229	–	133,807
Total expenditure	88,111	5,152	9,228	102,491	2,213	27,064	18,157	47,434	4,603	3,157	157,685

Note: Expenditures by NGOs could not be determined.

a. Household expenditure was not broken down by type of drug.

Source: Authors' compilations.

On the one hand, the bulk of preventive expenditures (73 per cent) are the result of private purchases of condoms. In fact, the government's share of preventive expenditures (3.5 per cent) is smaller than the resources made available through the international counterpart of the World Bank project.

On the other hand, public resources account for about 76 per cent of the expenditure on curative services. It is also interesting to note from the table that hospital care represents almost 55 per cent of the total expenditures for treating AIDS patients and that drugs represent another 36 per cent.

Finally, table 9 shows AIDS expenditures in per capita terms, as a percentage of the state's GDP and as a percentage of total health expenditures, and public expenditures on AIDS as a percentage of its total health expenditure. Expenditures on AIDS amount to about US$5 per citizen of the state of São Paulo, or roughly 0.06 per cent of the state's GDP. While these numbers may seem relatively small, it must be remembered that these resources are being used to treat about 19,000 PWA (or 0.06 per cent of the state's population). They represent 1.7 per cent of the total (public and private) health expenditures incurred in the state, or 2.3 per cent of the public sector's health expenditure.

Table 9. AIDS expenditures per capita and compared to other aggregates, state of São Paulo, 1995

	Per capita expenditure on AIDS (1995 US$)	AIDS as a per cent of GDP	AIDS as a per cent of health expenditure	Public AIDS expenditure as a per cent of total public sector health expenditure
Prevention	0.72	0.01	0.30	0.07
Treatment	4.04	0.05	1.67	2.31
Total	4.76	0.06	1.97	2.38

Source: Authors' calculations.

Section Three: Discussion

The data and the preceding analysis have clearly shown that the costs imposed by the AIDS epidemic in Brazil have been borne almost entirely by the public sector. While the contagious characteristic of AIDS may provide some justification for the presence of the government in preventive actions, in Brazil we observe that the public sector is also responsible for the financing *and* treatment of most AIDS cases.

Three main factors have determined the observed emphasis on the provision of curative services relative to prevention:

- The modern Brazilian health system is structurally (and historically) focused on treatment.
- Political pressure by different interest groups and by society in general has favoured treatment.
- Establishing an adequate preventive campaign has been difficult. Poor design and planning rendered early mass-media campaigns highly ineffec-

tive, creating an environment of scepticism with regard to the potential impact of such measures.

The dominant role assumed by the public sector in the provision of AIDS care is the result of four major determinants:

mkt failure

- the exclusion of AIDS coverage in most pre-payment plans and health insurance policies
- the high cost of treatment, particularly inpatient care
- the large share of low-income patients
- the refusal of most private hospitals to accept AIDS cases, due to the previous items and to the low reimbursement rates paid by the government combined with alleged low institutional capacity. As a result, there are no private health facilities that provide care specifically or systematically for AIDS patients.[12]

Therefore, while the first three factors have reduced the demand for a pure private market, the fourth factor has limited the supply of private services. As result, the Brazilian government was forced to extend its role, from being mostly a purchaser of services to becoming the major provider of care.

Notes

1 Reporting of more recent data was still incomplete.

2 The system is going through a process of decentralisation to the municipal level, which will be ultimately responsible for these payments. Federal resources would then be transferred to the cities on a lump-sum basis.

3 Most health plans, however, do not provide coverage for AIDS treatment. See the discussion below.

4 It was assumed that all teaching and research hospitals are public institutions (which somewhat overestimates the share of public hospitals for both categories of patients).

5 This small sample is clearly not representative of the universe of hospital services being provided. That is what was possible to collect given our time constraint, a problem aggravated by the fact that very few hospitals in Brazil monitor costs. However, the estimates seem to be within the general order of magnitude obtained from other sources.

6 Besides the revenue accruing from the reimbursement of services, public hospitals have their own budgets.

7 It is also possible that hospitals are cutting back services or having their assets depleted.

8 The larger proportions transferred to the government, relative to the private plans, reflect the fact that not all hospitals that receive SUS patients have contracts with these companies.

9 Physicians have reported to us that the restrictions of the medical plans have been bypassed by hospitalising AIDS patients using a limited (or different) diagnosis. This practice is defended in terms of compassion and

disagreement with the impediments imposed by the companies. These cases would not appear in any record as an AIDS-related hospitalisation.

10 This approach may somewhat underestimate actual costs, particularly with respect to medicines. According to the director of a major hospital, the cost of medicines is around 40 per cent of the cost of a hospital bed per day, which would be around US$132 or US$15.1 million in total.

11 Note that patients who can afford to pay for the medication are getting the drugs (free) from the government.

12 About 70 per cent of all beds are in private hospitals.

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E. Expenditures on HIV/AIDS in Tanzania

by Paula Tibandebage, Samuel Wangwe, Phare Mujinja, Richard N. Bail, and Donald S. Shepard

Section One: Background

The first three cases of AIDS in Tanzania were reported in 1983. By December 1994, a cumulative total of 53,247 cases had been reported. However, this probably represents only one-fourth to one-sixth of the true number of AIDS cases. The National AIDS Control Programme (NACP) estimates that about 200,000 people have acquired AIDS since 1983. The number of people with HIV is even more alarming; according to estimates based on blood donor prevalence, by 1995 as many as 1 million to 1.5 million Tanzanians could have been infected since the beginning of the epidemic (URT 1995).

A national policy on HIV/AIDS/STDs was put into effect in 1995 by the government of Tanzania, the goal of which is to mobilise and sensitise the community to get actively involved in preventing further transmission of HIV and to cope with the social and economic consequences of AIDS. Specifically, the policy aims to:

- increase the community's awareness of HIV/AIDS and its consequences through information, education, and communication
- prevent further transmission of HIV/AIDS through the use of such preventive measures as safer sex, testing, and counselling
- provide infected persons and their caregivers with appropriate social, medical, physical, and spiritual support through the existing health care system and through home-based care
- safeguard the rights and interests of infected persons by preventing discrimination in relation to employment, housing, treatment, travel, education, and other social services
- support and promote research activities geared to strengthening the national efforts toward control and prevention of HIV/AIDS/STDs
- safeguard the rights of the community as a whole against infection with HIV/AIDS/STDs

- define and coordinate the roles of different players involved in AIDS control and prevention
- create a national institutional framework that will coordinate the mobilisation of financial, human, and material resources for AIDS prevention and control.

The national policy on HIV/AIDS/STDs stipulates that HIV/AIDS patients receive the same level of care as other patients. Counseling is expected to be a basic component in the care of HIV/AIDS patients. The government encourages home-based care, where patients can be cared for and nursed by family members, though effective mechanisms to ensure home-based care are yet to be put in place. The policy also enumerates specific strategies for prevention of HIV/AIDS, including activities 'targeted to those groups involved in high risk behaviour', though cultural, religious, and political factors have precluded significant government-supported activities directed at these groups.

This study examines expenditures on AIDS, how they are broken down by source of financing and by intervention, and their major determinants. We use both quantitative data from research studies and government documents and secondary qualitative information. In addition, this study has benefitted from information obtained from the proceedings of a workshop attended by experts in clinical, epidemiological, social, and economic aspects of HIV/AIDS, and from interviews of officials in the government and NGOs whose activities include treatment, prevention, and/or mitigation of the impact of AIDS.

Section Two: Sources of funding and pattern of expenditures

In Tanzania there are four major sources of funding for the treatment, prevention, and mitigation of the impact of AIDS: government, donors, private individuals, and employers. Analysis of expenditure by the government, donors, and individuals is based on a World Bank study of health expenditures in East Africa in 1993 (World Bank 1996); we have integrated estimates for employer expenditures.[1] No attempt was made to account for insurance expenditures because health insurance is as yet quite uncommon in Tanzania. Allocations for HIV/AIDS and STDs are aggregated (except in the analysis of specific prevention strategies below).

Curative care (treatment) includes outpatient and inpatient care of AIDS and opportunistic infections. Prevention includes two types of activities – those directed at individuals, such as STD treatment, the screening of blood for transfusion, and distribution of condoms, and those directed to populations, such as education and mass information campaigns. Activities to mitigate the impact of AIDS, such as the care of orphans, account for substantial expenditures as well, but while some information is presented on the expenditures of NGOs, no systematic estimates could be made for the country as a whole.

Government spending on curative AIDS/STD services may be underestimated in the World Bank (1996) study because it likely excludes spending on treating patients abroad for Kaposi's sarcoma, complicated tuberculosis, and so on without specifically classifying these conditions as AIDS-related. Donor expenditures classified as 'preventive' draw on some of the curative resources supplied by government. For example, donors use hospital staff to carry out certain preventive activities, but the staff time is counted as being spent on 'curative' activities. Thus, government expenditure on preventive health is probably also underestimated. Finally, private spending on preventive health may be underestimated because it is based on household budget surveys, which generally collect data only on expenditure on curative care.

2.1 HIV/AIDS/STD expenditures vs. total health expenditures

Most financial resources in the Tanzanian health sector are allocated to treatment – 59.5 per cent of total health care expenditures (table 1). Prevention interventions receive 39.6 per cent of total health expenditures. In contrast, most financial resources for HIV/AIDS/STDs are allocated to prevention (84.1 per cent) (table 2).

Table 1. Total health spending by use and source of finance, 1993 (millions of Tshs)

	Use							
	Prevention		**Treatment**		**Nonessential**		**Total**	
Source	**Tshs**	**(%)**	**Tshs**	**(%)**	**Tshs**	**(%)**	**Tshs**	**(%)**
Government	4,205	(21.1)	14,845	(74.7)	868	(4.4)	19,918	(100)
(%)		(10.3)		(24.3)		(100)		(19.4)
Donors	29,513	(86.7)	4,534	(13.3)	0	(0)	34,047	(100)
(%)		(72.4)		(7.4)		(0)		(33.1)
Private	7,059	(16.9)	34,796	(83.1)	0	(0)	41,855	(100)
(%)		(17.3)		(56.8)		(0)		(40.7)
Employers	0	(0)	7,034	(100)	0	(0)	7,034	(100)
(%)		(0)		(11.5)		(0)		(6.8)
Total	40,777	(39.6)	61,209	(59.5)	868	(0.8)	102,854	(100)
(%)		(100)		(100)		(100)		(100)

Source: World Bank (1996) and authors (for employer data).

Table 2. Total spending on HIV/AIDS/STDs by use and source of finance, 1993 (millions of Tshs)

	Use					
	Prevention		Treatment		Total	
Source	Tshs	(%)	Tshs	(%)	Tshs	(%)
Government	178	(24.8)	540	(75.2)	718	(100)
(%)		(1.6)		(25.6)		(5.4)
Donors	10,974	(98.6)	155	(1.4)	11,129	(100)
(%)		(98.3)		(7.3)		(83.8)
Private	17	(1.6)	1,063	(98.4)	1,080	(100)
(%)		(0.2)		(50.4)		(8.1)
Employers	0	(0)	352	(100)	352	(100)
(%)		(0)		(16.7)		(2.6)
Total	11,169	(84.1)	2,110	(15.9)	13,279	(100)
US$ (000)	27,578		5,210		32,788	
(%)		(100)		(100)		(100)

Source: World Bank (1996) and authors (for employer data).

Private individuals finance the largest share of curative services, overall and for HIV/AIDS/STDs, accounting for half of curative care for HIV/AIDS/STDs and 56.8 per cent of curative care for all health conditions. The extent of government subsidy for care is similar for HIV/AIDS/STDs and all health care – about a quarter of all costs are paid for by government. Firms pay 11.5 per cent of expenditure on all curative care and 16.7 per cent of expenditure on curative HIV/AIDS/STD care.

An accurate estimation of the cost of hospital days for AIDS was beyond the scope of this study. However, Pallangyo and Laing (1990) estimated the average lifetime cost per AIDS case at Tshs 55,917 (US$347) for adults and Tshs 37,541 (US$266) for children. The number of hospital days per AIDS patient was estimated to be 31.9 for adults and 21.6 for children. At the time their study was performed this represented 12 per cent and 13 per cent of total days of care for adults and children, respectively.

Donors fund a very large share of preventive expenditure – nearly three-quarters of total health prevention (72.4 per cent) and nearly all of HIV/AIDS/STD prevention (98.3 per cent). Because of the large share of prevention interventions financed by donors and the large amount spent, donors fund a third of all health spending in Tanzania and 83.8 per cent of all spending on HIV/AIDS/STDs – a larger share in both cases than that of the government. The contribution of government to health and HIV/AIDS/STD spending is therefore very small – 19.4 per cent of total health spending and 5.4 per cent of spending on HIV/AIDS/STDs. Roughly three-quarters of government funds for health generally and for

HIV/AIDS/STDs are allocated to curative care, while nearly all donor spending is allocated to prevention. Likewise, almost all private expenditure is for curative care.

2.2 Expenditures for prevention

Further analysis was carried out to break down prevention into its component parts: information/education/communication (IEC), blood screening, STD control, and condom distribution (see table 3). These analyses were carried out using actual expenditures recorded by the NACP for 1994 and were combined with estimates based on transfusion statistics, STD studies, and condom data from the major nongovernment distributor. However, the figures in table 3 are not strictly comparable with the 'prevention' figures from the 1993 World Bank study because of different methodologies used in defining prevention and different completeness of reporting the components of prevention.[2, 3, 4]

Table 3. AIDS prevention expenditure by source, 1994 (millions of Tshs)

	Government		**Donors**		**Private**		**Total**	
Intervention	**Tshs**	**(%)**	**Tshs**	**(%)**	**Tshs**	**(%)**	**Tshs**	**(%)**
IEC	0	(0)	571.7	(100)	0	(0)	571.7	(100)
(%)	(0)		(36.3)		(0)		(29.6)	
Blood	10.6	(4.1)	135.4	(52.2)	113.2	(43.7)	259.2	(100)
(%)	(23.9)		(8.6)		(36.6)		(13.4)	
STD treatment	13.2	(19.4)	9.8	(14.4)	44.9	(66.0)	68.0	(100)
(%)	(29.7)		(0.6)		(14.5)		(3.5)	
Condoms	20.6	(2.0)	860.0	(83.4)	151.3	(14.7)	1,031.9	(100)
(%)	(46.3)		(54.5)		(48.9)		(53.5)	
Total[a]	44.5	(2.3)	1,576.9	(81.7)	309.4	(16.0)	1,930.8	(100)
US$ (000)	79.4		2,815.7		552.6		3,444.7	
(%)	(100)		(100)		(100)		(100)	

Note: Exchange rate – 560 Tshs/US$1.

a. Totals may not sum due to rounding.

Source: Authors' estimates from NACP (1994) and the Tanzania AIDS Project, funded by USAID.

Table 3 shows that about half of actual expenditure on four prevention activities in 1994 was spent on condoms (53.5 per cent), followed by IEC (29.6 per cent), blood safety (13.4 per cent), and STD control (3.5 per cent). Roughly half of all preventive spending by the government, donors, and private individuals was for condoms.

Overall, donors financed 82 per cent of expenditures on these four prevention activities. They bore 83 per cent of the costs of condom distribution, 52 per cent of the cost of safe blood supply, and 14 per cent of the costs of STD treatment. Private individuals paid two-thirds of the costs of STD treatment, 44 per cent of the costs of safe blood, and 15 per cent of the costs of condom distribution. Finally, the government paid for 19 per cent of the cost of STD treatment, 4 per cent of the costs of safe blood, and only 2 per cent of the costs of condom distribution.

2.3 Expenditures on mitigating the impact of HIV/AIDS

Levels of spending on mitigating the impact of AIDS are anecdotal and not based on systematic data collection. In 1994,, donors spent about Tshs 66.64 million (US$119,000) on mitigation through the NACP (NACP 1994). Of this amount Tshs 32.2 million (US$57,000) was donated through one large NGO (NACP unpublished data).

Actual expenditures on mitigation most likely substantially exceed these figures. First, there are many NGOs operating in Tanzania not covered in this study that work to mitigate the impact of AIDS. Second, private individuals incur substantial expenses on mitigation. Based on the findings of Mujinja and Over (1992), Tibakweitira (1995) estimates burial and mourning expenses for 30,000 AIDS deaths per year at about Tshs 2.2 billion (US$3.9 million). In the same study, estimated expenses that community members incur in taking care of orphans were about Tshs 9.2 billion (US$16.4 million) annually. This estimate is arrived at by taking into account maintenance costs for an estimated 150,000 AIDS-related orphans (NACP 1994) and school expenses for school-age AIDS orphans taken as 50 per cent of the total number of orphans. Even these figures may be underestimated, but, nonetheless, they are a strong indication that individuals spend much more on AIDS than has been thought. Third, employers assist in burial expenses of their employees and meeting transportation costs of families of the deceased. Noting that employers contribute more than mere payment of medical bills for sick employees, one expert cited an example of a factory that spent about Tshs 12 million (US$21,400) in assisting relatives and on transportation costs for 34 dead employees to their home areas for burial.

Section Three: Determinants of the level and pattern of expenditure

Tanzania is a low-income country, with a GNP per capita of only US$140. Total spending on health in 1990 was only 4.73 per cent of GNP (US$4 per capita).

3.1 Government spending

Several factors have influenced the observed pattern of government expenditures, which strongly favors curative care but at very low spending levels. The government policy on cost recovery was in transition over the course of this study. Patients were expected to pay a very modest fee, but exemption and enforcement probably varied greatly. Therefore, government curative services were very highly subsidised. Patients' biases toward curative rather than preventive care oblige the government to spend more on curative care.

Donors favor spending on preventive health. The government, therefore, must fill the gap by spending more on curative health. The public sector in Tanzania does not procure antiretroviral AIDS drugs. These drugs may be bought and used privately on an individual basis. No estimates are available of the extent to which this occurs.

The fear of the AIDS epidemic should make it easier for the government to target prevention activities to commercial sex workers. But commercial sex work is prohibited by law, so there are political as well as cultural reasons for the government to resist supporting such prevention programmes. In fact, government has had to accept that sex workers be assisted to reduce the spread of AIDS because if the government refuses it will be denied resources by donors.

3.2 Private spending

More is spent privately on curative health care and curative HIV/AIDS/STD care than by the government. During the course of this study, the extent of privatization of the health sector was increasing. More private clinics were opening on a fee-for-service basis; previously, these types of clinics had been illegal for the most part. Patients consulting public sector health services must frequently purchase drugs, as the government stores are often out of stock.

3.3 Donor spending

Since there is no cure for HIV/AIDS, donors believe that preventive activities are more cost-effective than treatment. They are increasingly channelling their spending through NGOs. One of the incentives influencing decisions to channel funds through NGOs is that they may be easier to monitor and are less bureaucratic than the government and are believed to reach target groups more effectively.

3.4 Trends in spending

There are indications that both government and donor expenditure have fallen since 1993. There have been nominal annual increases in the government's AIDS budget, but in real terms there may not have been any progress, since inflation has been running at about 20 per cent per year. A study of the worldwide trend in HIV/AIDS funding by donor agencies indicated declining support (Mann and Tarantola 1996). AIDS funds for Tanzania from the WHO (global and extrabudgetary funding from national governments) decreased from US$2.44 million in 1992 to US$1.97 million in 1993 and to US$1.06 million in 1994. Funds from the UNDP (bilateral) decreased from US$272,680 in 1992 to US$231,176 in 1993 and to US$129,658 in 1994 (NACP 1995). A consensus of Tanzanian AIDS experts at a one-day workshop held in Dar es Salaam in May 1996 confirmed that donor funding for AIDS in Tanzania is indeed in decline.

Notes

1 Estimates of employer expenditures were based on outlays for medical treatment of employees from a large insurance company in Dar es Salaam. We then extrapolated this to the number of employed persons we thought might be compensated in this way.

2 Estimates of expenditure on transfusions in table 3 assumed that there were 93,730 persons screened, of which 7.5 per cent tested positive and had to be tested a second time. We assumed that 60 per cent of the screenings took place in government hospitals and the balance in private hospitals. The cost per screening in the public sector was assumed to be Tshs 2,500 and in the private sector Tshs 3,500. The confirmation tests were assumed to be twice as expensive. Finally, we assumed that the government financed 10 per cent of the cost of screening, private individuals 30 per cent, and international donors 60 per cent.

3 In estimating the costs of STD treatment, we assumed that 4,038 cases were seen on average in each region annually and the cost of drug treatment is about Tshs 2,500 or about US$5. We assumed that half of all STD consultations occurred in private health facilities.

4 The figure for expenditure on condoms includes 60 per cent of the cost of the Tanzania AIDS Project (USAID).

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F. Levels and determinants of expenditure on HIV/AIDS in Thailand

by Sukhontha Kongsin, Charles S.M. Cameron, Laksami Suebsaeng, and Donald S. Shepard[1]

Section One: Introduction

Thailand's National AIDS Control Programme (NACP) began in 1987. The government has been actively involved in addressing AIDS prevention and control throughout the 1990s. In 1992, the government announced to the Parliament its planned policies for addressing AIDS, with an emphasis on prevention. However, despite an aggressive series of moves to stem transmission, the HIV/AIDS epidemic continues to grow. As of January 31, 1996, there were an estimated 33,410 persons with AIDS, about half of them living in the northern provinces (OPS 1996). About 750,000 persons were infected with HIV.

As Thailand enters the second decade of the AIDS pandemic, the NACP has evolved in complex and interrelated ways in response to the changing epidemic and lessons learned about prevention and control. The Ministry of Public Health has formulated a seven-part policy concerning AIDS prevention and control with the following elements:

- establishing the importance of the AIDS problem
- coordinating work
- preventing the spread of AIDS
- determining attitudes toward AIDS and HIV-infected patients
- providing health services relating to AIDS
- promoting AIDS research, and
- ensuring the rights of HIV-infected employees.

This report focuses on the costs of AIDS prevention and treatment. In the second section we present an analysis of the NACP budget by program and ministry. In the third section we estimate the costs of caring for persons with AIDS. In the fourth and final section, we analyse the combined national costs of AIDS prevention and control by source of funding and compare it with expenditures on other health programs.

Section Two: Expenditures of the National AIDS Control Programme

The National AIDS Prevention and Control Plan (1995–96) developed a six-component operational plan to deal with HIV/AIDS (NAPCP 1994). Table 1 shows total NAPCP expenditures for fiscal year 1995, by programme and participating ministry, in millions of baht.[2]

Table 1. National AIDS Prevention and Control Plan, fiscal 1995 budget (millions of baht)

Organisation	Prevention	Health promotion & medical services	Counseling	PWA & legal measures	Research & evaluation	Management	Total	Per cent
Office of the Prime Minister	54.8	0.0	0.0	0.0	0.0	0.0	54.8	4.4
Ministry of Defence	7.4	13.1	1.4	0.2	1.3	0.5	23.9	1.8
Ministry of Agriculture & Cooperatives	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.02
Ministry of Interior	8.2	18.9	1.0	0.0	0.5	49.4	78.0	6.2
Ministry of Public Health	44.0	591.3	13.9	23.5	3.7	268.9	945.4	75.1
Ministry of Education	13.8	0.0	0.0	0.0	0.0	0.0	13.8	1.1
Ministry of University Affairs	10.0	95.8	3.7	0.0	10.5	0.5	120.5	9.5
Ministry of Labour	6.1	0.0	0.0	15.4	0.2	0.0	21.7	1.7
Total	144.5	719.1	20.0	39.0	16.3	319.3	1,258.2	100.0
Per cent	11.4	57.2	1.6	3.1	1.3	25.4	100.0	

Note: Data may not sum to totals due to rounding.
Source: NACPC 1994.

The AIDS prevention and control expenditures for fiscal year 1995 were approved for approximately 1,258 million baht (US$50.3 million). Health promotion and medical services accounted for more than half of the budget, with virtually all financing coming from the Ministry of Public Health (MOPH). This item does not include treatment of classic sexually transmitted diseases (STDs), which is financed from a separate budget. Overall, the MOPH represented three-quarters of all budget allocations for AIDS. This designation reflects a policy decision in 1994 to fund most government activities related to AIDS prevention and control through MOPH.

In 1992, the government began to fund nongovernmental organisations (NGOs) with a budget of 11.5 million baht, administered through the Department of Communicable Disease Control of the Ministry of Public Health. The budget has fluctuated: 15 million baht in 1993; 10 million baht in

1994; and 75 million baht in 1995. Table 1 includes government funding for NGOs but not private funding for NGOs.

In addition to the national budget, since 1988, 19 international organisations and foreign governments have provided additional support. In 1990, foreign assistance represented 38 per cent of the AIDS budget. However, the Thai government's commitment to AIDS has continued to grow. By 1994 Thai government funding represented 84 per cent of the total AIDS budget.

Section Three: AIDS care and treatment costs

Sporadically, medical personnel have been afraid of caring for persons with AIDS. Concern about modes of transmission, possible infection, and social stigma contributed to this fear. In response, the Ministry of Public Health assigned the Bamrasnaradura Hospital (infectious disease hospital, Department of CDC) the responsibility for caring for AIDS cases. By 1988, all provincial hospitals under the Ministry of Public Health, as well as many community hospitals, were supposed to be equipped to care for AIDS patients. In the northern provinces, where hospitals treat many AIDS cases, community- and family-based health care is now an extension of the primary health care system. Day care wards are required to be linked with community-based care facilities. All of these activities have required governmental funding. In addition, the cost of medical care, including antiretroviral therapy, opportunistic infection therapy, and universal precautions, has increased severalfold since 1993.

3.1 Early estimates of AIDS treatment costs

Early in the epidemic (1988–90) a number of limited research studies were done that primarily focused on the direct costs of caring for people with AIDS (PWA) in hospital settings (Cameron and Schopper 1990; Sittitrai 1994). Because of the limited availability of clinical data, the relatively few cases of AIDS being treated, and the mixed reaction by the government to such investigations, the studies' results were of limited use to policymakers. However, they were helpful in understanding that the cost of caring for persons with AIDS was high for both inpatient and outpatient care. PWA needed expensive drugs, and they presented for medical care at a much higher rate than for the general population. In addition, PWA had few resources to cover costs. Direct costs for a PWA were estimated to represent 30–50 per cent of his or her annual income (Kongsin et al 1992).

At the Bamrasnaradura Hospital, a Bangkok-based hospital designated to care for PWA, AIDS-related care costs rose from 46 million baht in 1994 to more than 368 million baht in 1997 (Vilaiwan 1995). More broadly, direct medical costs for a PWA were estimated at 25 times per capita spending on health by the government (Kongsin 1995). Projections of direct and indirect costs for the late 1990s and beyond were in the billions of dollars (Viravaidya, Obremskey, and Myers 1993).

3.2 Care model spreadsheet

The spreadsheet is a simple multiplication tool to estimate total national costs of caring for persons with AIDS. It is divided into eight major categories of care. The number of PWA is distributed by type of care delivery. Subsequently, the spreadsheet multiplies this distribution by the unit costs of care to estimate total cost by type of care. The spreadsheet sums the total costs for each type and level. Initial estimates are for 1994.

As shown in table 2, care has been segmented into major categories offered by public and private providers in outpatient and inpatient locations. Home-based care is assumed to be an outreach of health centers. Hospitals have been subdivided into public and private, inpatient and outpatient types. As antiretroviral (ARV) drugs and treatment for opportunistic infections (OIs) are expensive and of particular interest to policymakers, they have been separately examined. Whether drugs are delivered in an outpatient or inpatient setting has little effect on costs.

Table 2. Per cent of people with AIDS receiving different types of treatment, 1994

Type of care	Public	Private	Total
Hospital, of which:			
Inpatient	36.6	1.6	38.2
Outpatient	5.6	0.3	5.9
ARV therapy	4.4	na	4.4
OIs	33.9	na	33.9
Private clinics	na	1.6	1.6
Pharmacies	na	6.2	6.2
Traditional healers	na	5.8	5.8
Home care	na	3.9	3.9
Total (%)	80.5	19.4	99.9

na Not applicable.

Note: The type of care sought by 2 per cent of AIDS patients could not be estimated.

Source: Authors' calculations based on official data and consultation with experts.

The first column of table 3 shows the distribution of the 39,803 cases of AIDS estimated for 1994 (NESDB 1994). Of the total cases, 29,309 were reported through the various data collection systems in Thailand. For the remaining one-quarter of the cases, there is no information about patterns of care sought and delivered. The assumption was made that the omitted 10,494 people with AIDS sought and received care in a way similar to those for whom data is available. Persons with AIDS typically seek care from multiple sources during the course of their disease. More research is needed to better understand both the demand for services, where people with AIDS seek care, and related costs.

The second column of table 3 presents the estimated unit costs for each type of service, in US dollars, converted at the rate of 25 baht per US dollar. As expected, private inpatient costs are significantly greater (more than 12 times) than inpatient costs at public hospitals. Private outpatient costs are almost five times more expensive than services at public outpatient departments. It is difficult to analyze these differences, as there is a lack of data concerning such factors as the types of care, quality of care, volumes of care, length of stay, and frequency of stays. It is interesting to note that home-based care is similar in size to the cost of inpatient care in public hospitals and a course of treatments for opportunistic infections. Costs represent total annualised capital and operating costs to treat a PWA for one year. It is assumed that a PWA receives treatment for one year before dying.

Table 3. Costs of services for AIDS treatment and care, 1994

Type of care	Number of PWA	Unit cost (US$)	National cost (US$ million)
Hospital, of which:			
Public inpatient	14,557	808	11.76
Public outpatient	2,231	163	0.36
ARV therapy	1,765	1,154	2.04
OIs	13,513	809	10.93
Private inpatient	636	10,052	6.39
Private outpatient	105	760	0.08
Private clinics	636	238	0.15
Pharmacies	2,482	271	0.67
Traditional healers	2,308	137	0.32
Home care	1,568	775	1.22
Total	39,801		33.92

Source: PWA by type of care: Kunanusont 1995; NESDB 1994; Vilaiwan 1995; authors' calculations. Unit costs: Prescott, Perriens, and Hill 1996; Kongsin et al 1992; Kongsin 1995; authors' estimate based on data from a private hospital.

Since 1992, the MOPH has allocated a significant amount of the budget each year to antiretroviral therapy (ART) drug supplies (Kunanusont 1995; Kunanusont et al 1996). The budget increased from 35 million baht in 1992 to approximately 295 million baht in 1995. ART is supplied for low-income patients, but only monotherapy is covered. About 80 per cent of ART is zidovudine, or AZT. Didanosine (ddI) and zalcitabine (ddC) together comprise about 20 per cent of ART. Decisions on ART regimens are being institutionalized in guidelines that are reviewed two to three times a year.

The price of AZT has decreased over time from 45 baht (then US$1.80) per 100 mg capsule to a range of 13 to 22 baht (US$0.52 to US$0.88). In 1996 the MOPH purchased AZT for 9.50 baht per 100 mg capsule. Lower prices were attributed to competitive bidding. Prices for ddI and ddC have not decreased significantly as there is no competition: one supplier controls the market for both drugs.

Since AZT represents the vast majority of ARV drug use, the decreasing price of AZT has greatly leveraged the MOPH's budget. In 1995, the total AZT budget was about 100 million baht out of a total budget of 300 million baht. In the future, drug budgets will be squeezed as about 25 per cent of reported AIDS and symptomatic HIV patients have requested ART.

The MOPH asked the World Health Organisation (WHO) to perform an external review on ARV use to help determine policy for developing countries in Asia and the Pacific. The review included the WHO, the World Bank, and the Thai MOPH. When evaluated using quality-adjusted life years (QALYs), preliminary findings indicated that costs (budgets) were greater than benefits. The QALY is calculated as the years of survival gained weighted by the functional ability of PWA (95 per cent for symptomatic HIVs and 70 per cent for AIDS). It was based on users of ARV therapy from 1993 through 1995. The study also indicated that zidovudine therapy was cost-effective in combatting vertical transmission. However, because of analytical issues related to data limitations and incompleteness, compliance, and programme coverage, more research is needed.

The last column in table 3 multiplies the unit costs in the second column by the PWA to arrive at an estimate of national costs. In 1994, about US$34 million, or 848.24 million baht, were expended for care from public and private sources. Since little, if any, international aid is used for care it can be assumed that this represents the vast majority of care costs.

The majority of costs – 68 per cent – comprise two categories: inpatient care in public hospitals and the provision of antiretroviral drugs (Kunanusont and Sirisritrirak 1994). In fact, ARV drugs alone represent 36 per cent of total care costs. In some cases all costs are assumed to be borne by one source, but in most cases, some of the cost is paid by both public and private sources. In 1994, it was estimated that the public sector provided 56 per cent of the funds, and the remaining 44 per cent come from private sources, such as fee-for-service and private insurance (authors' calculations).

Table 4 presents a summary of AIDS costs by the use and source of funding. An internal MOPH study in October 1996 indicated that expenditures were between 97 and 100 per cent of the budgets. Therefore, it can be assumed that the budgets are a reasonable surrogate for expenditures.

In 1994, US$95.5 million (2,388 million baht) was spent on AIDS prevention and treatment, by public and private sources. Of this amount, 88 per cent was provided domestically and 12 per cent came from official aid (e.g., bilateral). As the government of Thailand provides the vast majority of resources, the government has significant power to direct how those funds are invested. This situation differs from many other countries, where official aid dominates funding of HIV/AIDS-related activities.

If official aid is added to domestic expenditure, about 1,540 million baht (US$61.6 million), or 65 per cent of all spending, was provided for prevention. About one-third of expenditure was for treatment and care. The 1994 national AIDS prevention and control budget (US$50.3 million) represented 3.2 per cent of the total public health budget of US$1,572 million.

Table 4. AIDS expenditure by source of funding, 1994 (millions of US dollars)

Item	Total (US$ million)	Per cent
Domestic public and private expenditure, of which[a]	84.3	88
AIDS prevention	50.3	53
AIDS treatment and care	33.9	35
Official aid	11.3	12
Total AIDS-related expenditure	95.5	100

a. Excludes private expenditure on condoms.
Source: NACPC 1994; authors' calculations.

Assuming a 1994 population of 59.7 million, US$1.60 was spent per capita for AIDS prevention and care (World Bank 1993). The combined Thai and official aid budgets provided US$1.03 per capita for prevention. The cost of care for those *receiving care* was US$852 per person, or 36 per cent of per capita GNP (US$2,400). Thus, every case of AIDS prevented saves the government at least US$852 during the last year of a PWA's life. A significant amount could be cost-effectively spent on prevention, assuming a high efficacy of interventions. However, serious questions remain about the effectiveness of prevention interventions. Also, care costs represent one year of AIDS care. They do not include treatment of AIDS-related diseases for HIV-infected persons before they are clinically diagnosed with AIDS, which would increase the total care costs.

Combining total MOPH actual expenditures on AIDS with those for other departments resulted in total AIDS budgets of US$43.0 million (1,074 million baht) in 1994 and US$51.0 million (1,258 million baht) in 1995 – a 20.5 per cent increase. This increase is growing faster than the overall national budget of the government of Thailand, which grew from US$25.0 billion to US$28.6 billion, or a 14 per cent rise over that year.

Notes

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2 Fiscal year 1995 is the first year for which the budget was broken down by programme. The budget for 1994 (the year analysed in the rest of this paper) was for 1,142.5 million baht, of which 1,100.2 million baht were for the MOPH. The exchange rate was 25 baht = US$1.00.

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13

Policy options for antiretroviral treatment

by Nicholas Prescott

There is no cure for AIDS. The treatments available to extend life include those that treat opportunistic infections (OIs) and those that attack HIV, which are called antiretroviral medications. The latter are also used to prevent mother-to-child transmission of HIV.

This paper highlights four questions posed by economic analysis to help set priorities for government involvement with antiretroviral therapy for people living with HIV/AIDS.

- First, how does antiretroviral therapy link to broader health sector and country development objectives?
- Second, what alternatives need to be considered in using antiretrovirals?
- Third, which of these alternatives are realistically affordable given the country's resource constraints?
- Fourth, which of the affordable alternatives are most efficient in achieving a favourable development impact?

Section One: Linkage to development objectives

Any consideration of government involvement with antiretroviral treatment for HIV/AIDS needs to start with a clear view of how such treatment links to broader health sector strategy and country development goals. Despite its terrible human toll, HIV/AIDS is only one of many health problems facing developing countries. And health improvement is only one of many pressing development challenges involved in raising people's living standards, from reducing illiteracy to providing infrastructure and expanding job opportunities.

Looking at this linkage just in terms of improving health requires an epidemiological assessment of the magnitude of ill health due to HIV/AIDS relative to other health problems – not only its importance today but also its significance tomorrow as morbidity and mortality from the epidemic continue to grow. A suggestive indicator of these relative magnitudes is the burden of disease due to disability and premature death from different causes. Recent estimates of the global burden of disease expressed in terms of the number of years of healthy life lost (Murray and Lopez 1996) suggest the following for developing countries:

- In 1990 HIV/AIDS ranked as the 26th leading cause, contributing just 0.84 per cent of the total disease burden. Lower respiratory infections ranked first with a share of 9.07 per cent.
- In 2020 HIV/AIDS will move up to 10th place, accounting for 2.61 per cent of the disease burden. Meanwhile the leading cause of ill health will become ischaemic heart disease, contributing 5.93 per cent of the disease burden.

These global estimates illustrate the magnitude of the health problem that antiretroviral treatment aims to address, while at the same time emphasising the likely tradeoffs with other health problems of arguably greater magnitude. How much difference antiretroviral treatment could make to improving overall health therefore depends on the relative contribution of HIV/AIDS to ill health in specific country circumstances. Defining the strength of this link obviously requires a quantitative assessment of the number of people who are asymptomatic, symptomatic, and living with AIDS in the particular countries concerned. This in turn sets the stage for analysing alternatives for government involvement with antiretrovirals.

Section Two: Analysis of alternatives

Comparing alternative ways of addressing the HIV/AIDS problem – different types of antiretroviral treatment and treatment for opportunistic infections, along with other preventive interventions – will help decisionmakers choose the option most likely to achieve development objectives. It is not enough to think of the choice set just in terms of the technical options. In practice, alternative target groups, as well as public or private sector provision and financing, must also be examined.

- First, as for technical alternatives, innovations in antiretroviral treatment have greatly expanded the choice set to include a wide range of different drug regimes involving reverse transcriptase and protease inhibitors, which can be given singly or as combination therapies, with widely different implications for unit costs and clinical health outcomes.
- Second, target groups – ranging from people with AIDS, to symptomatics or asymptomatics, to infected pregnant women – are also different even with the same technical option. The different population sizes involved have major implications for the aggregate costs of treatment, as well as its likely effectiveness in reducing the burden of disease. For example, Thailand's population of 58 million was estimated to have a nationwide pool of some 746,000 infected adults in 1996, including a caseload of around 47,000 adults with AIDS, plus another 61,000 symptomatics, and 22,000 infected pregnant women.
- Third, whether antiretrovirals are or could be provided by the private sector needs to be examined carefully. Is there a private market for antiretrovirals? Is there a private sector delivery system that could provide

them? If so, public provision of antiretrovirals might induce substitution of patients seeking treatment out of the private sector, thus lowering the net impact of public sector provision.

- Finally, is there any rationale for public financing of antiretroviral treatment? One important justification for public subsidies involves interventions that prevent transmission of infection to others. This externality argument clearly does apply to the use of antiretroviral treatment for preventing perinatal transmission from infected pregnant mothers to their infants. But it does not seem to apply in using antiretrovirals to treat other infected groups, unless viral load is eliminated, as has been suggested with protease inhibitors.

A different justification for subsidising antiretroviral treatment is that government policy generally does provide subsidies to help insure against catastrophic financial risks due to ill health. But then governments should be consistent in applying their particular subsidy across all diseases, without discriminating in pricing policy between people with HIV and those who are not infected. Granting preferential subsidies to patients with HIV/AIDS risks crowding out uninfected patients that might get more health benefits from the fixed amount of available subsidies.

Section Three: Affordability

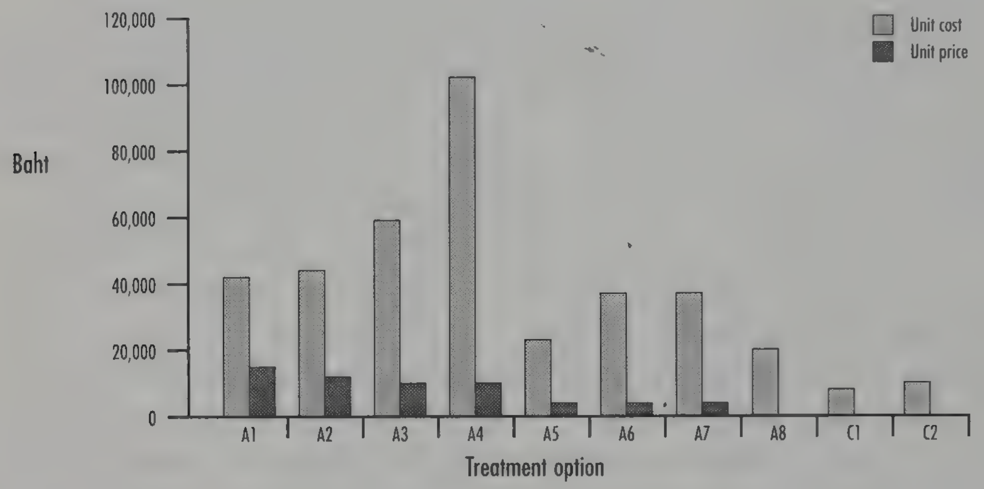
Analysing the financing options for antiretrovirals leads straight into the affordability question that is of such importance in low- and middle-income developing countries. Policymakers need to focus on the subset of antiretroviral alternatives that are affordable from the point of view of those who have to finance the relevant costs, i.e., government and households. The distribution of treatment costs between these parties depends on two factors:

- the choice of pricing policy and
- its interaction with the relevant budget constraints.

Estimates from Thailand illustrate these factors in the context of a middle-income country with a per capita income of US$2,410 in 1994 (Prescott et al 1996). Figure 1 shows the estimated unit costs of treatment expressed in Thai baht (approximately 25 baht per US$), together with the associated prices/subsidies for a range of 10 treatment options for HIV/AIDS. Eight of these regimes involve administration of antiretroviral drugs, not including the new protease inhibitors:

- A1: adult AIDS – universal coverage of optimal treatment for OIs
- A2: adult AIDS – zidovudine (ZDV) monotherapy[1]
- A3: adult AIDS – ZDV/ddI or ddC sequential monotherapy
- A4: adult AIDS – ZDV/ ddI or ddC combination therapy
- A5: adult symptomatic HIV – ZDV monotherapy
- A6: adult symptomatic HIV – ZDV/ ddI or ddC sequential monotherapy
- A7: adult symptomatic HIV – ZDV/ ddI or ddC combination therapy
- A8: adult asymptomatic HIV – ZDV monotherapy

Figure 1. Pricing policy (in baht per case year, at 1995 prices)



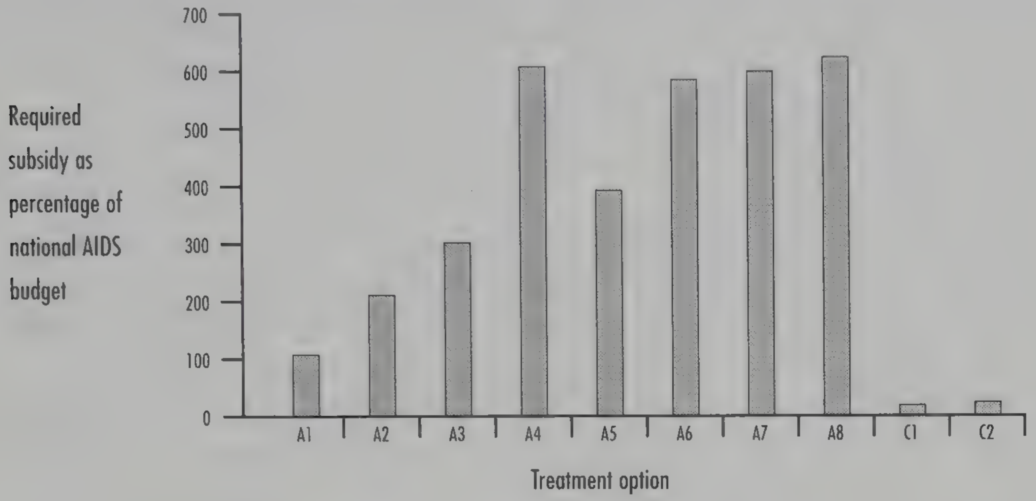
- C1: mother-to-infant (MTI) transmission – formula feeding
- C2: MTI transmission – ZDV plus formula feeding.

Expressed in equivalent US$, the unit costs of treatment for adults with AIDS range from about US$2,000 per patient-year with zidovudine monotherapy (model A2) to US$4,000 per patient-year with zidovudine/ddI or ddC combination therapy (model A4). The annual unit costs of treatment for symptomatic and asymptomatic target groups appear lower because these earlier stages in the life cycle of treatment involve fewer provider visits and OI drugs, but later progression to AIDS will raise unit costs. Meanwhile the unit cost of treating pregnant women following the ACTG076 protocol is only about US$500 per mother-child pair (model C2) (Sperling et al 1996). The pricing policy regime superimposed on these costs provides free – i.e., fully subsidised – antiretrovirals to patients, while requiring around one-third cost recovery for OI drugs and inpatient/outpatient services. This subsidy structure reduces patient costs during AIDS to less than US$500 per year.

Thailand

Whether such a subsidy policy is affordable from the government's point of view depends on the ratio of fiscal requirements to the projected budget constraint. Figure 2 shows the simulations assuming maximum utilisation generated by universal coverage and perfect compliance. Here the relevant budget constraint is assumed equal to the entire budget allocated to the National AIDS Programme. Options with index values greater than 100 are not affordable. Under the assumed combination of pricing policy and fiscal constraints all the treatment options involving antiretrovirals appear unaffordable, with the notable exception of preventing perinatal transmission, which has an affordability index of less than 20 per cent. Just treating OIs (model A1) for the projected number of AIDS patients would exhaust the whole budget, without adding any antiretroviral drugs.

Figure 2. Fixed impact subsidy/budget ratio (National AIDS Programme=100)

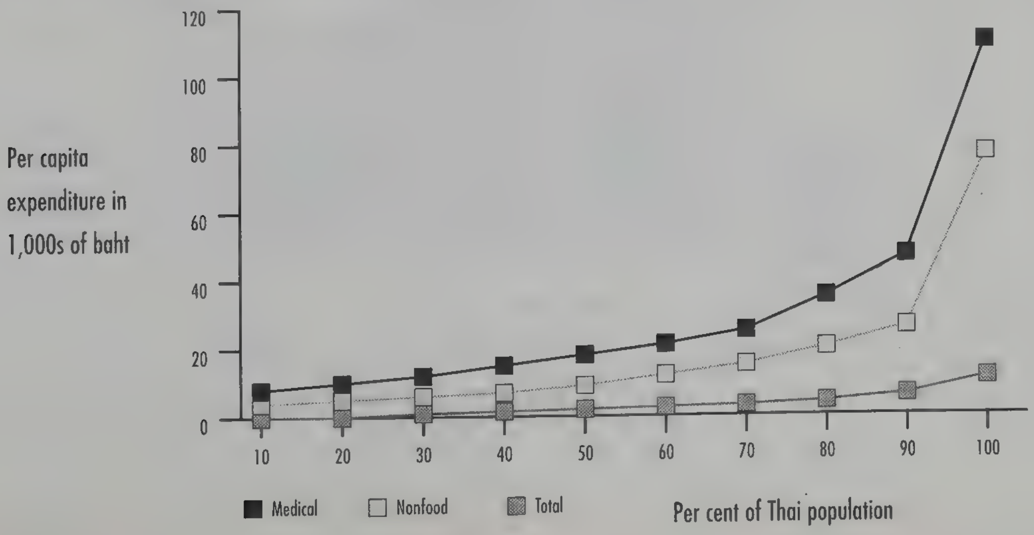


To assess affordability of this pricing policy from the patients' point of view, it is important to think in terms of the distribution of incomes, or its proxy, per capita consumption expenditure (PCE), instead of the average level of income in the whole population. Figure 3 shows the cumulative distribution function for three different categories of PCE:

- medical care
- nonfood expenditure
- total consumption.

The vertical axis shows the annual amount of PCE, while the horizontal axis shows the proportion of the total population. Suppose, for example, that average nonfood expenditure represents a realistic budget constraint on patients' ability to pay for HIV/AIDS treatment expenditures. Then the subsidised price of antiretroviral treatments for adults with AIDS – around 9,000 baht or US$500 from figure 1 – seems unaffordable for around 50 per cent of the whole population, while still being affordable by the rest.

Figure 3. Cumulative distribution of per capita consumption expenditure in Thailand



Section Four: Efficiency

These empirical examples from Thailand, a middle-income developing country, suggest that large-scale programmes of antiretroviral treatment may not be easily affordable either from the fiscal standpoint of governments or by many private households, except in using antiretrovirals for the prevention of perinatal transmission.

Efficiency considerations point in the same direction as affordability. Figure 4 shows the simulations of effectiveness based on optimistic estimates of clinical efficacy and assuming perfect patient compliance and universal coverage. In practice, however, one might expect programme coverage and compliance rates to be much less than 100 per cent. Effectiveness is measured in terms of the proportionate reduction in the burden of disease due to HIV/AIDS, or the gain in quality-adjusted life years (QALYs) that can be attributed to different treatment options. The simulations suggest:

- first, that the potential effectiveness of antiretroviral treatment options, excluding protease inhibitors, is clustered around 10–15 per cent of the baseline disease burden, and
- second, the effectiveness of preventing perinatal transmission may be nearly as high as treating adults.

Putting these effectiveness estimates together with the cost figures makes it possible to compare the cost-effectiveness of antiretroviral alternatives (figure 5). The adult antiretroviral regimes generate around 30 QALYs per million baht of expenditure. In contrast, preventing perinatal transmission appears to produce more than 600 QALYs per million baht – a twentyfold difference.

Figure 4. Expected life years gained by each treatment model as a per cent of total national burden of disease

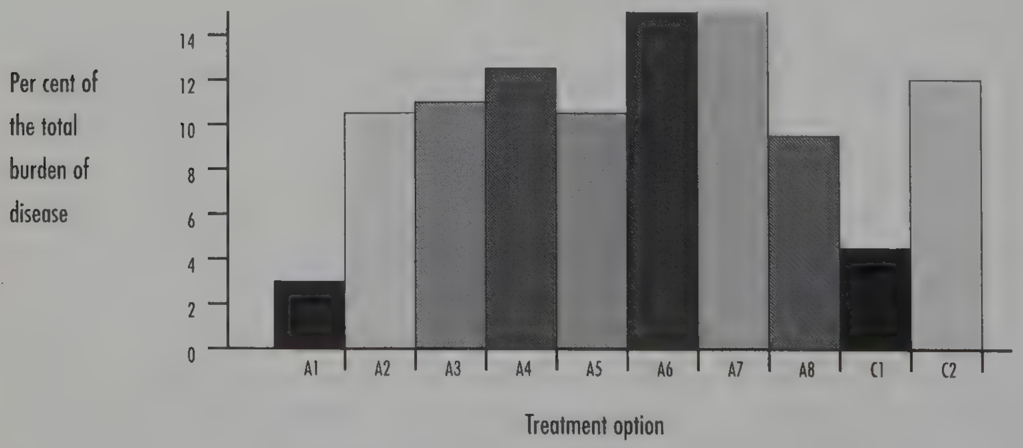
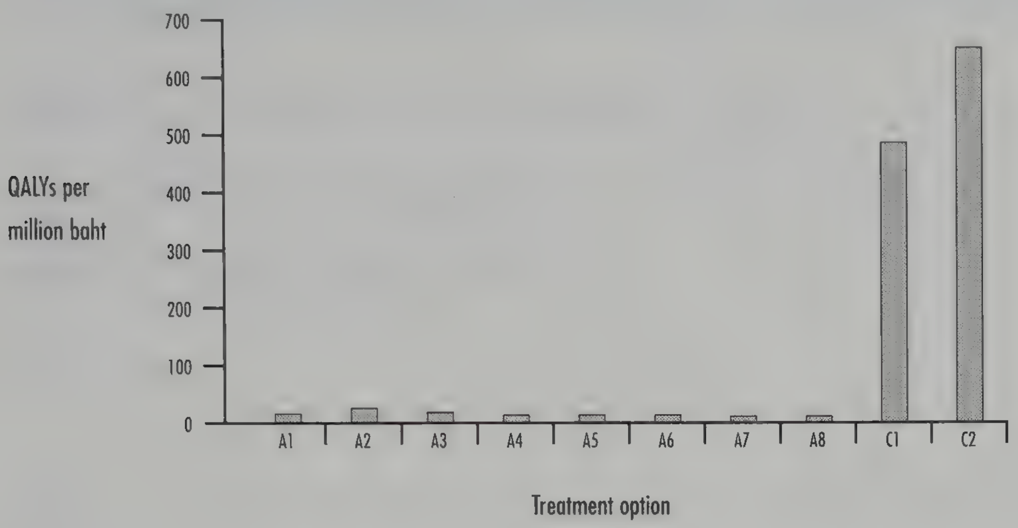


Figure 5. Effectiveness-cost ratios according to treatment regime



Note

1 The drug zidovudine is also known as AZT.

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14

Safety of blood and blood products: An additional burden for the health sector facing HIV/AIDS

by Lieve Fransen

Section One: Blood safety – what does it mean in developing countries where HIV/AIDS is widespread?

It is worthwhile reminding ourselves at the outset of the high infectivity of contaminated blood transfusions. They are almost 100 per cent certain to produce HIV infection in the recipient.

But in developing countries, blood transfusion was a medical act to which little attention was given before the emergence of HIV/AIDS. The vast majority of the world's blood donations and transfusions are given in the industrialised countries, and the relatively few transfusions performed in the poorest countries were most often carried out in emergency situations where the blood was collected on the spot, at the level of the individual hospital, from paid blood donors or from family members, and with neither the time nor often the resources to screen the donated blood for HIV or other infections.

This happened because there were no blood banks organised to store and distribute blood, and transfusions were totally decentralised operations carried out at the level of the individual hospital. Indeed, the capacity to collect and store larger amounts of blood through blood banks was often not present because blood banks require a large management capacity at several different levels. These levels include:

- blood donor information and recruitment
- blood collection
- blood typing
- blood screening for infectious diseases
- blood storage so that the blood is ready for use when needed.

To ensure the basic conditions for the blood to be safe, that is, not contaminated by HIV or other infections, an organised blood donation system is required, based upon voluntary unpaid donations.

The reality in most developing countries is, however, very different than that in richer countries, where a proper blood transfusion service is present. In developing countries, screening for an extra lethal infection, such as

HIV/AIDS, demands a total reorganisation of the existing system for collecting and transfusing blood, or even the development of a new and effective system where none existed before.

This reality also means that, in countries with a high rate of HIV infection in the general population, it is wasteful to collect blood from a paid donor or a family donor because these persons are often more likely to be HIV-infected than donors belonging to a pool of selected voluntary blood donors.

Furthermore, the majority of the most reliable tests (Elisa tests) used to screen blood donations before transfusion take more time and are better controlled and more cheaply done on several donations at once – for example, once a week – rather than on a piecemeal basis just before each transfusion is to be given, while the family is waiting.

Experience in several countries has also demonstrated how HIV infection of people who have received infected blood decreases the trust of the general population in the health services, and sometimes also decreases their trust in decisionmakers, politicians, and the HIV prevention messages that they put out.

Section Two: Who receives most of the blood transfused in developing countries?

In developing countries a great deal of the blood collected is used for children and pregnant women. This is different from developed countries, where blood is mainly given for haemotology emergency and surgery cases. But very few studies are available on who receives blood in developing countries, and great variations can occur depending on the main pathologies in these countries. In Zambia the European Commission, which was contributing funding to the blood transfusion service, was able to demonstrate that 41–48 per cent of the blood units were used in paediatric and neonatal wards, 19–20 per cent in obstetric wards, and 21–26 per cent in surgical and medical wards (Watts et al 1995). This means that between 59 per cent and 68 per cent of blood units were used for children and women (the majority during pregnancy and child birth).

In Guinea in 1994, 22.5 per cent and 22 per cent of blood units were used on paediatric and maternity wards, respectively (European Commission 1997). In 1996, 61 per cent of transfusions in Uganda were given to children, and another 25 per cent were to women during pregnancy or after childbirth (E.J. Watson-Williams and J. Goddard, personal communication).

Section Three: Does blood safety contribute to prevention of the spread of HIV? Does it save lives?

In some countries, blood transfusion services have actually contributed to the spread of the HIV epidemic because contaminated transfusion equipment and needles were shared among many blood donors and recipients. However, this is a consequence of bad medical practice and is related not solely to blood transfusion but to the use of medical equipment generally.

Generalising across all developing countries, transfusion of blood or blood products infected with HIV probably has only a minor role to play in the spread of the epidemic in the population because the average number of new infections passed on by persons infected through blood over his or her lifetime is most often low. HIV-infected children will take years before they have sexual relations and potentially spread the virus, and adults who have had blood transfusions are not the group with the highest rate of different sexual partners.

However, the case is totally different in particular countries. It is hard to imagine, for example, what would have happened with the epidemic in Uganda and Zambia if those countries had not changed their existing practices but had continued to transfuse blood in the old manner with an HIV prevalence of 20–25 per cent. So while it may not be the top priority for using public funds for reducing HIV transmission, provision of safe blood is:

a essential for preserving the reputation of the health service, and
b a proper candidate for public subsidy, in order to start and develop a safe blood system, in countries such as the above, on externality grounds as well as affordability.

But when measuring the effectiveness of safe blood programmes, we should look not only at HIV and other infections (preferably also secondary infections) prevented by a proper blood transfusion service, but also to the fact that blood transfusion in itself is a lifesaving medical act in many different circumstances. For example, in Uganda, it was calculated in 1993 that a total of 3,253 lives were saved through 20,156 blood units transfused, as in table 1.

Table 1. Lives saved by transfusion, Uganda, 1993

	Children	Adults	Total
Number transfused	11,515	8,641	20,156
Expected to die without transfusion	5,758 (50%)	3,898 (45%)	9,656
Die despite transfusion	3,801 (33%)	2,592 (40%)	6,393
Number of deaths prevented	1,957	1,306	3,263

Source: European Commission 1997.

It was also calculated that 1,863 HIV infections were prevented among the ones who survived: 1,033 children and 830 adults. Another 471 hepatitis B infections were prevented among the survivors.

However, it must be noted that this calculation overstates the number of HIV infections prevented because it assumes that the same number of transfusions would have been given with unsafe blood in the absence of the safe blood programme. On the other hand, the calculation ignores HIV infections averted through the parallel large-scale programme of education and counselling of donors – an unquantifiable but probably large number.

Section Four: What does blood safety entail?

The three main subcomponents of a blood safety strategy are:

- a selective recruitment of voluntary blood donors in order to decrease the collection of blood from people highly infected with HIV
- b screening of blood donations by laboratory tests to detect both HIV and other infections (which other infections depends on the epidemiology of the particular country) and to discard as much infected blood as possible
- c reduction in the use of blood in general through better selection criteria and alternative methods to replace the use of blood and blood products.

As to item (a), in Zambia and Uganda it was estimated that selective recruitment of voluntary unpaid blood donors can contribute to averting 85 per cent of blood-related HIV transmissions. In the same countries items (b) and (c) accounted for 11 per cent and 4 per cent of averted infections, respectively. This assumes, however, that the interventions are incremental in that order. Of course, if all blood were screened successfully, nearly 100 per cent of transfusion infections would be averted, regardless of the source of blood or its end use. However, in a poor country with a high rate of HIV, it is less wasteful of time and effort and less costly to focus on the initial blood donor selection, to ensure that as few donations as possible are infected in the first place, than to overlook this and attempt to organise a very effective blood testing strategy in the knowledge that a high proportion of donations will have to be not only discarded but also destroyed. Moreover, the residual risk is linked to the seroprevalence of the donors.

Table 2 demonstrates how it has been possible in Uganda, where the EC helped to finance the re-creation of a near-defunct national blood transfusion service, to decrease the collection of blood from highly infected populations (e.g., paid donors and relatives) through a strategy of selective recruitment of voluntary nonpaid donors. This reduction also brings with it another major benefit of selective donor recruiting, that is, the public information campaigns and the pre- and post-donation counselling that are an essential part of the donor recruitment campaign. This educational intervention possibly produces an additional reduction of HIV transmission as a result, but, as noted, this is difficult to measure. Selective recruitment of voluntary blood donors has halved the HIV-infection rate among donors in Lusaka, Zambia (table 3).

Table 2. Decline in the per cent of HIV-positive blood donors in Uganda, achieved through selective donor recruitment and self-deferral

	1989	1996
Blood donors from schools	5.2	1.2
Blood donors from nonschool	14	3.9
Replacement blood donors	24	8
Total	14.4	4.38

Source: Nakasero Blood Bank, Kampala, Uganda.

Table 3. Decline in the per cent of HIV-positive blood donors in Lusaka, Zambia, achieved by selective recruitment of voluntary donors

Year	1990	1991	1992	1993	1994
HIV+	20	17	16	13	10

Source: Watts et al 1995.

From this it can be concluded that, in a country with a high HIV prevalence among its adult population, a minimum strategy could be to change the collection of blood from paid, family, or replacement donors to a pool of voluntary, school-going donors.

Section Five: What does it cost and can people pay?

In Uganda the recurrent cost to produce one unit of safe blood was calculated to be about US$30. This includes the selective recruitment of voluntary donors and the screening for HIV and HBsAg (marker for hepatitis B) and was calculated at a time (1995) when 25 per cent of the young adults were HIV-positive and 6 per cent were carriers of the hepatitis B virus.

The prevalence among the 32,100 units of blood collected was 5.5 per cent for HIV and 6.3 per cent for HBsAg. A total of 26,194, or 81.6 per cent, of the blood units collected were used. When the total recurrent cost per unit was calculated for Zambia, Zimbabwe, and Rwanda, the outcome was very similar to the roughly US$30 in Uganda.

Section Six: Incremental costs

In the case of Uganda (with a population of 19 million people, according to the 1995 census, and US$170 per capita GNP) the total health budget is about US$3 per capita per annum. The total recurrent cost for the blood safety programme in Uganda is US$1.2 million–US$1.5 million annually, including blood testing not related to HIV. The total public expenditure on health, including donor contributions, is of the order of US$50 million annually (this does not include local government figures). The actual costs of a comprehensive blood safety strategy is therefore less than 3 per cent of the total public expenditure on health in Uganda.

The incremental cost per HIV case averted through safe blood provision varies widely because it is related to the basic blood safety capacities already in place in the country. In a country such as Uganda where virtually no facilities were in place before intervention started (1988), the total cost was calculated to be plus or minus US$170 per case averted.

However, in Zambia, where basic capacities were already in place when EC support started (1991), the incremental cost per case averted was between US$20–US$24, while the total cost was similar to Uganda, at between US$171–US$235 (Watts et al 1995). However, in this calculation the same simplistic assumption was made that an equal number of unsafe transfusions would have been given in the absence of a safe blood supply. On the other hand, these calculations do not take into account any secondary infections prevented.

Section Seven: Ability to pay and public equity

A government can take the view that it is not a priority use of public finances to subsidise blood safety, because potential secondary infections acquired from people infected through blood are low in number and it is therefore up to the individual to pay in order to receive a unit of safe blood when needed.

But this view rests on evidence that there is a prima facie adequate willingness and ability to pay among households. In the poorest countries, however, it is quite improbable that the majority of the recipients would be able (whatever their theoretical willingness) to meet costs in the region of US$30 per unit of safe blood. This is because:

- the cost of one unit of blood is a significant percentage of annual per capita income
- patients may well need more than one unit
- when income distribution is highly skewed, average income is far higher than modal income
- income is not necessarily in cash; in rural economies, cash is often rare except in trivial amounts
- women and children are often adversely treated in the intra-household distribution of consumption
- patients requiring a blood transfusion invariably need to pay other fees, both official and illicit, for the same treatment episode.

Taken together, these points suggest that it is not feasible in the poorest countries to recover the whole cost of safe blood from most beneficiaries, and the attempt to do so by full cost pricing would exclude the great majority from benefit. The fact that full cost recovery is impracticable does not exclude partial cost recovery, but (at least in anglophone African countries) the average rate of cost recovery (as a percentage of total public expenditure on health) at present is low, at around 5 per cent.

Section Eight: Cost of blood screening

The unit costs of screening are of course lower than the unit costs of the total process of collection, screening, storage, and distribution that blood transfusion services require. The figure given for Zambia, Rwanda, and Uganda was US$7–US$8 for screening alone, compared with the figure for the same countries of US$30 for the entire process.

But blood screening is not available as a separate service. What the patient receives is a unit of blood, screened or not, and without the choice. The costs of screening alone are irrelevant; it is the costs of the whole process that are relevant to the cost recovery issue. The distinction between marginal and average costs may or may not be significant, in the absence of empirical data on cost functions. It may be speculated that, starting from current levels of provision in developing countries, an increase in scale would be accompanied by declining costs for processing and distribution, but increasing costs for collection.

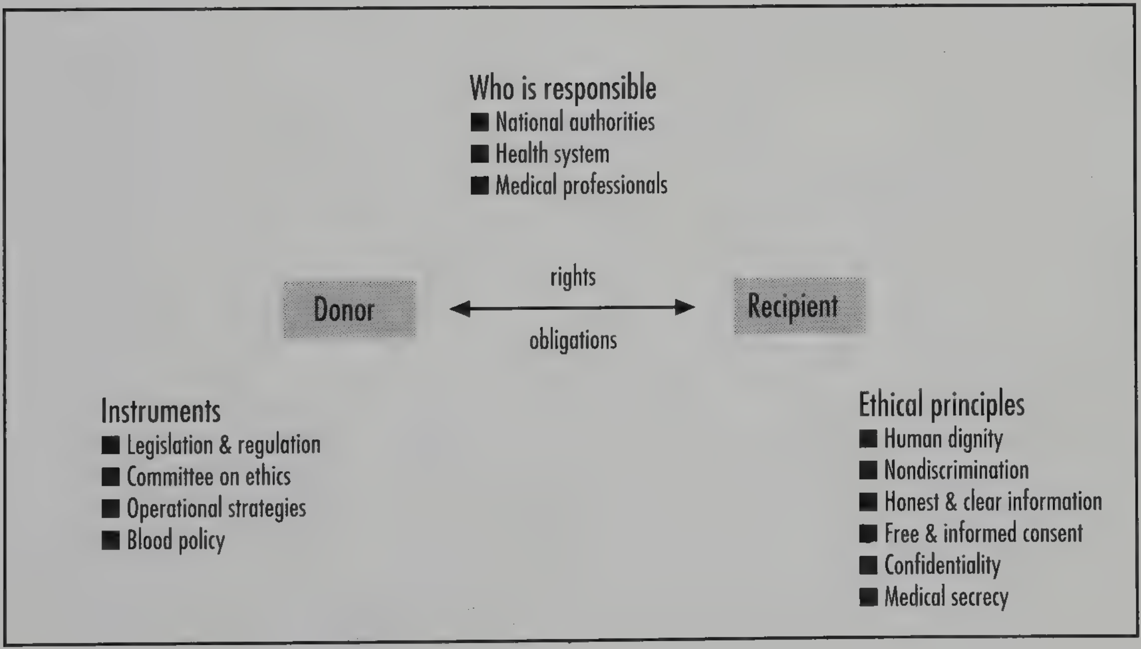
Section Nine: What then is the minimum role of government in relation to safe blood?

Taking into account the reality of HIV and the risk that people may acquire HIV through infected blood transfusions – in situations where people cannot protect themselves and have to trust the medical services – it is crucial that the government as a minimum strategy informs the population about the potential and actual risks and about the benefits of organising voluntary unpaid blood donations. Health personnel should also be adequately trained.

Next, it is beneficial to regulate and/or legislate in order to enforce minimum standards and procedures for a national blood policy. This can include, for example, the protection of the rights of the donors by protecting them against infection caused by bad medical practices, such as the use of non-sterilised equipment, and also the protection of the rights of the recipients by setting a strategy of recruitment of voluntary, unpaid, low-risk blood donors.

Third, it is also important as a matter of social equity to ensure that poor people have access to the same standards of blood safety as the rest of the population.

Figure 1. Blood safety



Source: European Commission 1997.

Thereafter, there must be a debate in each country about how much further the public finances can stretch, whether they can finance the provision of blood safety for all, and how much of the costs can be or will be recovered from recipients (figure 1). The outcome of this debate will depend not only upon public economics, public health, the prevalence of HIV, and the existing health sector capacities in relation to blood, but also upon political circumstances, the priorities of politicians, and the importance given to ethics and patient rights.

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Part IV

The Impact of AIDS on Households

15

The economic impact of adult mortality on households in Rakai district, Uganda

by Rekha Menon, Maria J. Wawer, Joseph K. Konde-Lule, Nelson K. Sewankambo, and Chuanjun Li

Section One: Introduction

This study assesses the economic impact of adult mortality on households in the Rakai district in southwestern Uganda. An issue of concern, especially in the case of the AIDS epidemic, is the impact of a 'shock' to the household due to the death of an economically active adult. Available empirical evidence regarding this is very sparse, especially in the case of the demographic impact of adult mortality on household composition and socioeconomic status indicators (e.g., ownership of durable goods).

The death of an economically active adult may result in changes in household size and composition and a decline in the household's socioeconomic status. In response to the 'shock' of fatal adult illness like HIV/AIDS, households may liquidate their assets to pay for medical treatment and funeral costs.

Using information regarding adult mortality in households between 1989 and 1992 in the Rakai district of Uganda, this study attempts to provide a better understanding of the impact of an adult death on a household's composition, size, and economic status. The study is composed of the following parts.

- The Rakai survey.
- The economic and demographic impact of adult mortality (mortality among 15–50 year olds) on all households that completed the panel are assessed. This section also assesses whether the socioeconomic and -demographic characteristics differ among households that experience an adult death of an HIV-positive person compared to households where there is no adult death of an HIV-positive person. A multivariate analysis is conducted to study the effect of community, household, and the deceased individual's characteristics on the size of the impact of an adult death on the household's ownership of durable goods.
- Policy implications.

Section Two: The Rakai Survey

A longitudinal sero-epidemiological study was conducted between 1989 and 1992 in the Rakai district in southwestern Uganda. This district has a population of 385,000 in an area of 5,000 square kilometres (Serwadda et al 1992). The communities in Rakai district are divided into three geographic strata:

- main road trading centres (5 per cent of communities), which serve local, domestic, and international traffic
- intermediate trading villages (4 per cent of communities) located on secondary roads
- rural agricultural villages (91 per cent of communities) located off main and secondary roads.

The smallest political unit in the district was the Level One Resistance Committee (RC1), each comprising on average 100 households. The Rakai Project population-based cohort was established in 1989 using two-stage stratified cluster sampling. In the first stage, 21 RC1 were chosen at random from the complete list of RC1s. In 1990, the cohort was enlarged by expanding each of the 21 existing clusters by 20 contiguous households (for a total of 60 households per cluster), and adding 10 new clusters of 60 households each. In addition, at each survey round, new households (85 in 1990) resulting from the dispersion of families whose members were already enrolled in the study were entered into the study. Of the 31 clusters in the sample, 11 are located in main road trading centres, 11 are in trading villages in secondary roads, and 9 are in rural villages off main and secondary roads.

Each year, an enumeration team visited all study households (1,945 households since 1990) and updated the list of all adults and children resident in these households for at least three months of the previous year, whether present at the time of the enumeration or not. A venous blood sample was obtained from consenting adults aged 13 years and above. HIV infection was determined by enzyme-linked immunosorbent assay (ELISA) test with Western blot confirmation.

Baseline and annual censuses and serological/interview surveys were conducted between 1989 and 1992 to provide data on HIV prevalence and incidence, socio-demographic characteristics (e.g., age, sex, education, occupation, place and type of residence), behavioural characteristics (e.g., sex partners, condom use), and household composition (including mortality, fertility, and migration). This analysis focuses on the 1,945 households that were enrolled in the study since 1989–90 and followed until 1992.

Section Three: The economic impact of adult mortality

This section compares the characteristics of two types of households at the time of the baseline survey and the last visit:

- households that experienced an adult death between the first and last visit
- households that did not.

Further, among households that experienced an adult death, comparisons are made between households where at least one of the deaths was of an HIV-positive adult and households where none of the deaths were of an HIV-positive adult.

While the cause of death of HIV-positive adults was not clinically assessed, a related study using the Rakai cohort study data reported that among adults in the economically active group (15–64 years), 78.2 per cent of deaths were associated with HIV infection (Sewankambo et al 1994). Mortality among HIV-positive adults was tenfold higher than among HIV-negative adults in the same age group. As such, it may be appropriate to infer that the underlying cause of death for those HIV-positives who died was HIV-related.

Earlier studies using the Rakai cohort study data have shown that HIV infection and death are most common among young, economically active adults. As such, most households that experience the 'shock' of an HIV-related death suffer long-term economic drain through the loss of expected lifetime stream of income. Further, an in-depth survey of 327 households in Rakai district showed that those households that experienced an HIV-related death reported substantial financial outlays for HIV-related adult illness and burial. Two-thirds of these households sold property to pay for medical treatment or burial costs.

It must be noted, however, that there is evidence to show that external forms of assistance are available in Rakai to help cope with these economic losses. Extended family members and local community and nongovernmental organisations contributed to medical and burial costs in 40 to 68 per cent of the cases (Konde-Lule et al 1993).

Among the 1,945 study households, 1,667 (85.7 per cent) completed the panel. The average household among those that completed the panel consisted of about five persons. Of these households, 20 per cent had no children (less than 15 years), 5 per cent had no adults (15–50 years of age), and 73.5 per cent had no elderly people (>50 years of age at the beginning of the panel).

Among households that completed the panel, detailed information on socioeconomic and -demographic characteristics of the head of household was available in 1,343 households (80.6 per cent) and 27 per cent of these households were headed by a woman. The average age of the head was 43 years, 43.7 per cent of household heads had at least completed primary school, and 87 per cent were Christian.

Between 1989 and 1992, there were a total of 591 deaths in the 1,945 study households, of which 337 deaths (57 per cent) were among adults aged 15–50 (table 1). Of the 409 deaths in the 1,667 households that completed the panel, 199 deaths (49 per cent) were among adults aged 15–50. Eleven per cent of these households experienced an adult death during the panel, of which 7 per cent had more than one adult death (table 2). Of these 199 deaths, 117 (58.8 per cent) were among HIV-infected individuals, 99 (84.3 per cent) of them being between 20 and 45 years of age (table 3). Nearly 7 per cent of the households that completed the panel experienced the death of an HIV-infected adult in the three-year follow-up period between 1989 and 1992.

Table 4 reports the per cent of households experiencing an adult death during the panel by location of residence. Of the 199 deaths among adults aged 15–50 years in households that completed the panel, 27 (13.6 per cent) were heads of households, with 12 of them (44.4 per cent) being female heads.

Table 1. Distribution of deceased household members by age

	All study households (1,945)		Households that completed the panel (1,667)	
Age at death	Per cent	n	Per cent	n
0–6	28.0	165	36.3	149
7–14	3.2	19	4.1	17
15–0	57.0	337	49.0	199
51–64	5.2	31	4.1	17
65+	6.6	39	6.5	27
Total	100.0	591	100.0	409

Table 2. Distribution of households according to number of deaths (number of households = 1,667)

	Deaths during panel	
Number of deaths	Adults (aged 15–50 years)	All ages
None	88.96	89.02
One	10.26	9.40
Two	0.66	1.38
Three	0.12	0.12
Total[a]	100.00	100.00

a. Totals may not sum due to rounding.

Table 3. Frequency distribution of adult deaths (15–50 years) by age and HIV status in households that completed the panel

	HIV-negative		HIV-positive		
Age group	n	Per cent	n	Per cent	Total n
15–20	11	13.4	11	9.4	22
20–35	55	67.1	75	64.1	130
35–45	11	13.4	24	20.5	35
45+	5	6.2	7	6.0	12
Total[a]	82	100	117	100	199

a. Totals may not sum due to rounding.

Table 4. Per cent of households experiencing an adult death (15–50 years) by location, 1989–1992

Location	Per cent of households experiencing an adult death	Per cent of households experiencing a death of an HIV-infected adult	Total households
Trading centre	12.2	7.9	567
Trading village	12.0	6.5	586
Agricultural village	8.8	5.3	514
Total sample	11.0	6.6	1,667

3.1 Household composition and adult mortality

Table 5 summarises the evolution in household composition between the periods 1989 and 1992 for households with and without an adult death during the panel. Table 6 compares the characteristics among households with an HIV-negative adult death and those with an HIV-positive adult death during the panel.

In the first visit, households that later experienced an adult death were larger (6.4 members) compared to households that did not experience a death (4.8 members). The differences between these households disappeared by the last visit, with each having 4.7 members on average. In households with no adult death the size decreased by only 0.1 member during the panel, while the household size fell substantially – by 1.7 members (including the member who died) – in households that experienced an adult death.

The distribution of members by age group in these different types of households are illustrated in the third to fifth panels of table 5 and the fourth to sixth panels in table 6, respectively. The per cent of households with no children under 15 years remained relatively unchanged in households that experienced no adult deaths. There were fewer households with no children under 15 years at baseline among those households that did experience an adult death compared to those that did not experience an adult death. By the end of the panel, however, the per cent of households with no children under 15 years nearly doubled among those households with an adult death to approximately the same level as that in households that did not experience an adult death.

Among households with the death of an HIV-positive adult, a relatively higher per cent had no children and this percentage increased over time. However, this increase was less than that in households with the death of an HIV-negative adult. The per cent of households with no adult (15–50 years) increased ninefold in households that experienced an adult death and twelvefold in cases where the death was of an HIV-positive adult. The per cent of households with elders above 50 years of age in both of the groups did not change greatly over time.

The death of an economically active adult often increases the dependency ratio, leaving households where children and the elderly have less support.[1]

Table 5. Characteristics of households with and without an adult (15–50 years) death during the panel

Characteristics	Households without an adult death (n=1,483)	Households with an adult death (n=184)	All households (n=1,667)
Mean household size			
First visit	4.8***	6.4*	5.0^{+}
Last visit	4.7	4.7	4.7
Dependency ratio			
First visit	1.3	1.2	1.3
Last visit	1.4	1.4	1.4
Per cent of households with no children (0–14 years)			
First visit	21.4**	10.9*	20.2^{+}
Last visit	21.9	19.0	21.6
Per cent of households with no adults (15–50 years)			
First visit	5.5*	1.1*	5.0^{+}
Last visit	6.8	9.2	7.1
Per cent of households with no persons > 50 years			
First visit	74.1*	69.0	73.6
Last visit	71.5	66.3	70.9
Distribution according to changes in household size and composition between visits (%)			
Same size, same composition	42.3	0.0	37.6
Same size, different composition	8.7	1.1	7.7^{+}
Smaller	45.6	98.9	51.5^{+}
Larger	3.4	0.0	3.1
Distribution according to migration between visits (%)			
Joiners only[a]	15.1	10.9	14.6
Leavers only[b]	28.1	42.4	29.6^{+}
Both joiners and leavers	14.0	25.5	15.3^{+}
Neither joiners nor leavers	42.8	21.2	40.4^{+}
Per cent of households with			
Car/Lorry			
First visit	1.1	1.6***	1.1
Last visit	1.3	0.0	1.1
Bicycle			
First visit	33.9*	38.6	34.4
Last visit	41.0	34.8	40.3
Radio			
First visit	29.7*	39.7	30.8^{+}
Last visit	37.0	35.9	36.9

a. Excludes births

b. Excludes deaths.

* Difference between households between the first and last visit is statistically significant at p<=0.01; ** difference is significant at p<=0.05; *** difference is significant at p<=0.10; + difference between households with and without an adult death is statistically significant at p<=0.01; ++ difference is significant at p<=0.05; and +++ difference is significant at p<=0.10.

Households that experienced an adult death began the study with a similar dependency ratio to those that did not experience a death (1.2 compared to 1.3). The increase in the dependency ratio occurs only in households where the death was of an HIV-positive adult (see panel 3, table 6).

An earlier study using the Rakai cohort study data examined the household and economic aspects of orphanhood related to the HIV epidemic in Rakai district (Konde-Lule et al 1994). Orphans were defined as individuals under 15 years of age who have lost one or both biological parents. Among all children under the age of 15 residing in the study households, 14.8 per cent have one or both parents deceased. Community focus groups and interviews with key informants suggested little or no presence of homeless children in the district.

However, Konde-Lule et al (1994) also reported that there is evidence that orphan households in Rakai are of lower socioeconomic status (measured in terms of per capita income) than households without orphans. Further, orphans, particularly girls, are also less likely to be attending school than non-orphans. They also suggest that households headed by the very young (about 2 per cent) receive financial support from extended families and the community. Another study, which was part of the project for the enumeration and needs assessment of orphaned children in Uganda sponsored by the Save the Children Fund, revealed that a large percentage of the guardians of orphans in Rakai district were 50 years of age or older (Dunn 1992).

As seen in the sixth panel of table 5, 42.3 per cent of households that did not experience an adult death remained identical (same size and composition), 8.7 per cent were of the same size but different composition, 45.6 per cent became smaller, and less than 3.5 per cent became larger during the entire survey period between 1989 and 1992. On the other hand, of the households that did experience an adult death, 1.1 per cent remained the same size, nearly 99 per cent became smaller, and no households became larger during the course of the cohort study.

Table 6 compares the turnover in household members among households where the death was of an HIV-positive adult and households where the adult who died was HIV-negative. All households that experienced an HIV-positive adult death became smaller during the period between the first and last visits of the study. Among those households with an HIV-negative adult death, 2.7 per cent remained identical in size while 97.3 per cent became smaller.

Table 6. Characteristics of households with HIV-negative and HIV-positive adult (15–50 years) deaths during the panel

Characteristics	Households with a death of an HIV-negative adult (n=74)	Households with a death of an HIV-positive adult (n=110)	Households with an adult death (n=184)
Characteristics of deceased			
Mean age at death	31.9	30.2	30.8
Per cent female	40.5	67.3	57.3^{+}
Mean household size			
First visit	6.9*	6.0*	6.4^{+++}
Last visit	5.1	4.4	4.7
Dependency ratio			
First visit	1.3	1.2**	1.2
Last visit	1.3	1.5	1.4
Per cent of households with no children (0–14 years)			
First visit	5.4***	14.6**	10.9^{+++}
Last visit	13.5	22.7	19.0
Per cent of households with no adults (15–50 years)			
First visit	0.0	1.8*	1.1
Last visit	2.7	13.6	9.2^{++}
Per cent of households with no persons > 50 years			
First visit	71.6	67.3	69.0
Last visit	68.8	64.6	66.3
Distribution according to changes in household size and composition between visits (%)			
Same size, same composition	0.0	0.0	0.0
Same size, different composition	2.7	0.0	1.1
Smaller	97.3	100.0	98.9
Larger	0.0	0.0	0.0
Distribution according to migration between visits (%)			
Joiners only[a]	8.1	12.7	10.9
Leavers only[b]	44.6	40.9	42.4
Both joiners and leavers	27.0	24.6	25.5
Neither joiners nor leavers	20.3	21.8	21.2

Characteristics	Households with a death of an HIV-negative adult (n=74)	Households with a death of an HIV-positive adult (n=110)	Households with an adult death (n=184)
Per cent of households with			
Car/Lorry			
First visit	0.0	2.7***	1.6
Last visit	0.0	0.0	0.0
Bicycle			
First visit	37.8	39.1	38.6
Last visit	37.8	32.7	34.8
Radio			
First visit	36.5	41.8	39.7
Last visit	35.1	36.4	35.9

a. Excludes births.

b. Excludes deaths.

* Difference between households between the first and last visit is statistically significant at $p<=0.01$; ** difference is significant at $p<=0.05$; *** difference is significant at $p<=0.10$; $^{+}$ difference between households with and without an adult death is statistically significant at $p<=0.01$; $^{++}$ difference is significant at $p<=0.05$; and $^{+++}$ difference is significant at $p<=0.10$.

To understand precisely how these changes occurred, information on the patterns of migration in households with and without an adult death is provided in panel seven of table 5. Nearly 42 per cent of households that experienced an adult death had leavers compared to 28 per cent of households without an adult death.[2] In contrast, nearly 43 per cent of households that did not experience an adult death had neither leavers nor joiners, compared to 21 per cent of households with an adult death. Only 14 per cent of households that did not experience an adult death had both joiners and leavers, compared to 25.5 per cent of households with an adult death. Overall, households with an adult death had more leavers than households without an adult death (67.9 per cent vs. 42.1 per cent).

The share of households with both joiners and leavers or neither joiners nor leavers is about the same in households with an HIV-positive adult death and in those with an HIV-negative adult death, as seen in table 6. However, households with an HIV-positive adult death had slightly more joiners (37.3 per cent vs. 35.1 per cent) and fewer leavers (65.5 per cent vs. 71.6 per cent) compared to households with an HIV-negative adult death.

These differences in net migration patterns between households with an HIV-positive adult death and those with an HIV-negative adult death were not statistically significant. Thus, even for households that concluded the panel study, those that experienced an adult death lost proportionately more residents than those that did not experience an adult death.

3.2 Household assets and adult mortality

Ownership of durable goods is a good indicator of economic status, and households that experience an adult death often have to sell such goods to meet expenses (funeral and other household costs) in the event of a death of an economically active member. The proportion of households owning a car, lorry, radio, or bicycle is seen to decrease in households that experienced an adult death during the panel, while households where there are no adult deaths see an increase in ownership of durable goods (table 5). In fact, none of the households that experience an adult death own a car or lorry by the end of the study.

It is also interesting to note that this decline in resources occurs only in households in which the adult death was of an HIV-positive individual. Households with an HIV-negative adult death experience little or no change in their economic status as defined by the ownership of durable goods (see last panel of table 6). It is important to note that this occurs even though the ages of the adults who died were of an equivalent range (15–50 years) in either case. Households that subsequently suffered the death of an HIV-positive adult were in an economically stronger position at the beginning of the study in comparison to other households in the sample. It is evident therefore that the economic impact of HIV-related deaths is stronger and often can lead households that start at an economically stronger position to lose much of their savings while trying to meet health care and funeral expenditure needs of the infected members and/or to make up for the loss of income when an HIV-positive adult in the economically active age group dies.

To analyse the size of the impact of an adult death on the household's economic status as measured by the ownership of durable goods, a multivariate analysis was performed using panel data on radio ownership at two points – at the beginning and at the end of the study period.

The impact of various household, community, and individual variables on the change in the ownership of durable goods (i.e., radio) was studied using a random-effects probit model. Multivariate analysis shows that characteristics of the community, household, and the deceased individual all affect the size of the impact of an adult death on the household's ownership of durable goods. Household ownership of durable goods is more vulnerable to a death in agricultural village communities than in trading centres or trading villages. The presence of an iron roof in the household (an indicator of high economic status) reduces the vulnerability of radio ownership to a death in the household. The vulnerability of radio ownership to an adult death is also lower in households where there are more adults or children present. This is also true for households that have experienced more than one adult death during the panel.

While the age of the deceased individual is not an important determinant of the vulnerability of a household's radio ownership to an adult death, the gender of the individual is an important determinant. Households where the deceased was male were seven times more likely to suffer a reduction in ownership of durable goods than households where the deceased was female. It is possible that this effect is due to a loss in income in the household as a result of the death of an economically active adult.

In contrast, the HIV status of the deceased individual does not have any significant influence on the size of his/her death's impact on household radio ownership. A joint test of significance conducted shows that the characteristics of a death in the household (i.e., the deceased individual's characteristics) and the number of deaths have a significant effect on the size of a death's impact on ownership of a radio.

3.3 Characteristics of the head of the household and adult mortality

Among the 1,483 households that did not experience an adult death, information on the head of household was available for 1,192 households. Among the 184 households that did experience an adult death, information on the head of household was available for 151 households. The socioeconomic and -demographic characteristics of the heads of households used in this study are those that were observed at the baseline interview.

Table 7 compares the characteristics of the head of the household among households that experienced an adult death and those without an adult death, by gender of the head. A significantly larger percentage of households that suffered the death of an adult (38.4 compared to 25.5 per cent) were headed by a woman. There were no marked differences in the characteristics of the male head of household between those households that experienced an adult death and those that did not. However, female heads of those households that experienced an adult death tended to be better educated than the female heads of households with no adult death.

Table 7. Characteristics of the head in households with and without the death of an adult (15–50 years) member during the panel, by gender of the head

	Households without an adult death during the panel			**Households with an adult death during the panel**			**All households**
Characteristics of head of household	**Male (n=888)**	**Female (n=304)**	**All (n=1,192)**	**Male (n=93)**	**Female (n=58)**	**All (n=151)**	**(n=1,343)**
Mean age	41.7	46.0	42.8	46.2	43.5	45.2	43.1
Distribution of households by schooling							
Secondary and higher	15.0	8.9	13.4*	17.2	8.6	13.9	13.5
Completed primary	33.7	18.1	29.7*	32.3	37.9	34.4	30.2
Some primary	28.4	31.3	29.1	24.5	22.4	24.5	28.6
None	23.0	41.8	27.8*	27.2	31.0	27.2	27.7

(Table continues on next page.)

Table 7 (*Continued*)

Characteristics of head of household	Households without an adult death during the panel Male (n=888)	Female (n=304)	All (n=1,192)	Households with an adult death during the panel Male (n=93)	Female (n=58)	All (n=151)	All households (n=1,343)
Distribution of households by religion							
Catholic	61.8	71.0	64.2*	63.4	74.1	67.6	64.6
Protestant	24.7	17.8	22.9**	22.6	12.1	18.5	22.4
Muslim	10.0	9.2	9.8	12.9	8.6	11.3	10.0
Other	1.4	0.0	1.0	0.0	0.0	0.0	0.9
None	2.1	2.0	2.1	1.1	5.2	2.7	2.2
Distribution of households by occupation							
Agricultural worker	56.8	50.3	55.1***	54.8	46.6	51.7	54.7
Service worker[a]	29.2	26.6	28.5	30.1	31.0	30.5	28.8
Other self-employed, student, other[b]	14.1	23.0	16.4*	15.1	22.4	17.9	16.5

a. Market vendor, bar/restaurant/hotel worker, truck driver, police/military, nurse/medical/government worker, teacher.

b. Fisherman, handicrafts, beer, household worker, unemployed.

* Difference between households with a male and a female head is statistically significant at p<=0.01; ** difference between households with a male and female head is significant at p<=0.05; and *** difference between households with a male and a female head is statistically significant at p<=0.10.

Table 8 compares the characteristics of the head of the household among households where the death was of an HIV-positive adult and households where the adult who died was HIV-negative. In 60 per cent of the households where there was an adult death, the death was that of an HIV-positive adult, 6.4 per cent of these deaths being of two HIV-positive adult members. Of households with a death of an HIV-positive adult, a significantly larger percentage (41 compared to 32 per cent) were headed by women. Female heads of households that experienced an HIV-positive adult death tended to be better educated and to work in the cash economy compared to the female heads of households with an HIV-negative adult death.

Section Four: Some conclusions about survivor assistance

Two conclusions can be drawn:

- Households cope with an adult death by altering in size and composition.
- Households dealing with the death of an HIV-positive adult incur economic losses through a depletion of some durable goods.

Table 8. Characteristics of the head in households with HIV-positive and HIV-negative adult deaths, by gender of the head

	Households with an HIV-negative adult death			Households with an HIV-positive adult death		
Characteristics of head of household	Male (n=36)	Female (n=17)	All (n=53)	Male (n=57)	Female (n=41)	All (n=98)
Mean age	47.2	40.5	45.1	45.5	44.7	45.2
Distribution of households by schooling						
Secondary and higher	16.7	0.0	11.3	17.5	12.2	15.3
Completed primary	33.3	29.4	32.1	31.6	41.5	35.7
Some primary	19.4	35.3	24.5	29.8	17.1	24.5
None	30.6	35.3	32.1	21.0	29.3	24.5
Distribution of households by religion						
Catholic	61.1	64.7	62.3	65.0	78.0	70.4
Protestant	25.0	5.9	18.9	21.0	14.6	18.4
Muslim	13.9	11.8	13.2	12.3	7.3	10.2
Other	0.0	0.0	0.0	0.0	0.0	0.0
None	0.0	17.6	5.7	1.75	0.0	1.0*
Distribution of households by occupation						
Agricultural worker	61.1	53.0	58.5	50.9	43.9	48.0
Service worker[a]	30.6	32.3	32.1	29.8	29.3	29.5
Other self-employed, student, other[b]	8.3	11.8	9.5	19.3	26.8	22.5*

a. Market vendor, bar/restaurant/hotel worker, truck driver, police/military, nurse/medical/government worker, teacher.

b. Fisherman, handicrafts, beer, household worker, unemployed.

* Difference between households with and without an adult HIV-positive death is statistically significant at p<=0.10.

For policymakers, households as an economic and social unit may be easier to target than individuals. It is therefore of interest to policymakers to know the extent to which adult deaths (especially in the wake of the AIDS epidemic) affect households and the mechanisms through which households cope with alterations in size and composition. The death of an economically active household member may result in an economic drain on households through loss in expected lifetime stream of income. Further, increasing health expenditures and costly funerals decrease household savings as households liquidate assets, such as land, livestock, or durable goods, to cover these expenses.

Survivor assistance through emergency relief, such as food programmes, are often suggested as a means of helping households cope with the 'shock' of an adult death. As seen in this study, households often cope via other natural mechanisms, such as by altering in size and composition. Survivor assistance programmes must therefore be designed to account for these changes in household sizes and composition in order to have the desired positive effect. Further, survivor assistance programmes must be careful not to hamper already existing systems like extended family support mechanisms.

An adult death is seen to lead to an increase in the dependency ratio, leaving a large number of households where children and the elderly have less support from economically active adults. This increase mainly occurs in households where the death was of an HIV-positive adult. In Rakai district, in the present stage, there is evidence that orphans are being absorbed into families with adults or are receiving assistance from extended families and nongovernmental organisations. As the epidemic progresses, however, the socioeconomic situation of orphans may deteriorate, requiring governments to provide emergency relief to orphan households with little or no extended family support.

There is also evidence to show that an adult death leads to a decline in economic resources (indicated by ownership of durable goods like a car, radio, or bicycle), while economic resources among households that did not experience an adult death increased during the course of the study. It is also interesting that this decline in resources occurred only in households in which the adult death was of an HIV-positive member. Households with an HIV-negative adult death experienced little or no change in their economic status as defined by the ownership of durable goods. As such, it is evident that HIV-related adult illness and burial costs impose great financial burden on households, leading to a depletion of economic resources.

Therefore, targeting assistance to severely affected households to cope with HIV-related illnesses and funeral costs can prevent households from depleting their savings. This is further confirmed by a multivariate analysis that shows that community characteristics (i.e., location of the household), household characteristics (i.e., household composition), housing characteristics (i.e., presence of iron roof), and characteristics of the deceased individual (i.e., gender) all affect the size of the impact of an adult death on the household's ownership of durable goods, as measured by the ownership of a radio.

An important policy question that arises is whether assistance programmes aimed at households as a unit should target all households that experience the death of an adult or only those in which the death is of an HIV-infected adult. Evidence from this study shows that the economic impact of HIV-related deaths is stronger and often can cause households that start in an economically stronger position to lose much of their savings while trying to meet health care and funeral expenditure needs of the infected members and/or make up for the loss of income when an HIV-positive adult in the economically active age group dies.

Further, as HIV-related infections usually claim younger and economically productive adults, these households also suffer long-term economic losses.

Notes

1 The dependency ratio is defined here as the number of individuals under 15 or greater than 50 years of age as a proportion of the number of adults aged 15–50.

2 A leaver was identified as that member of the household whose interview status was coded as having left the household, without returning to the sample, between the first and last visit.

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16

The impact of AIDS on the economy of families in Côte d'Ivoire: Changes in consumption among AIDS-affected households

by Nathalie Béchu

Editor's note:

The survey analysed below by Nathalie Béchu was part of a larger study of 600 households in Burundi and Haiti as well as Côte d'Ivoire. Households were selected into the sample after being identified by one of three index health facilities as containing an adult with AIDS. At least one adult in the survey households was ill with AIDS and had charge of one or more children. The objective was to analyse the changes in the living conditions of these households as the illness progressed and when the ill person died.

From among the 200 households studied in Côte d'Ivoire, 120 were followed over a period of 20 months, and 107 households were followed through to the end of the study period. So the data below derive from 107 households. Beginning seven and a half months after they were first recruited, the households were interviewed six times at two-month intervals.

Household size varied from two to 16 people, with an average of 6.3 people (though the average dropped from 6.6 to 5.9 from beginning to end of the project). Eighty-seven households were in urban areas and 20 in semi-rural, and 62 of those who were ill were men; 45, women. Eighty-three of those who were ill were still living by the end of the survey period, and 24 had died.

The survey was part of a research programme coordinated by the Centre International d'Enfance and cofinanced by the Agence Nationale de Recherche sur le SIDA and the French Ministry of Cooperation and Development. ORSTROM and the University of Côte d'Ivoire collaborated in the study. This edited extract is from the full paper.

Section One: Introduction

Our initial hypotheses were that:

- the difficult situation that households in Côte d'Ivoire face in the context of economic crisis and a critical shortage of health care, aggravated by the wide-ranging effects that AIDS could potentially have on household budgets, could presage major upheavals in the normal consumption patterns of households affected by the epidemic

- the spread of the illness may well be the root cause of a substantial and rapid rise in expenditures on health care and of a simultaneous decline in other expenditures, these effects arising both from the need to rebalance the family budget because of an increase in health care expenditures and from the fact that the household's sources of income diminish.

So how do these hypotheses stand up to an analysis of the results of the survey of the 107 households in Côte d'Ivoire?

Section Two: Comparison with consumption choices made by other Côte d'Ivoire households

The consumption data obtained from the 107 households were compared with the results of a study conducted in Yopougon, the second largest district in Abidjan, in May 1992 and based on a large sample of 2,064 households.

2.1 Current consumption compared to the general population

The households monitored within this survey were mostly in the middle or lower social categories. Theirs is essentially the consumption of subsistence. It is dominated by expenditures on food and accommodation, respectively, or 32 per cent and 8.3 per cent of all expenditures recorded over the period. Other expenditures linked to basic necessities also make up a substantial part of the budget, with total basic expenditures accounting on average for more than half of total expenditures (53.4 per cent). Other current and exceptional expenditures account for 38.2 per cent of total consumption.

These figures are very similar to results obtained from an independent survey of the consumption patterns of the population of Yopougon. There, basic expenditures accounted for 56.1 per cent of total household expenditures, and other current and exceptional expenditures (other than health) accounted for 38.2 per cent. This latter figure compares with 36 per cent in our survey if expenditures on the health of people other than the person with AIDS (2.2 per cent) are excluded.

Although the structure of consumption of the two population groups is similar, their levels of consumption are very different. The average monthly expenditure of Yopougon households reaches CFA franc 131,381 whereas it is less than half that in our survey (FCFA 65,368). This difference reflects the fact that incomes in our households were only half as high. This can be confirmed by comparing the occupations of the heads of households; they are often more stable in the households studied during the Yopougon survey.

2.2 Expenditure on health

The main difference between the structures of consumption of these two populations – one consisting of families affected by AIDS, the other more representative of the general population – is to be found in the size of the budget devoted to health.

The proportion of household budgets spent on health care is almost double in households in which there are people with AIDS (10.6 per cent compared with 5.6 per cent in the Yopougon households). Furthermore, health costs specific to the person with AIDS account for almost 80 per cent of the health budget item, that is, 8.4 per cent of total consumption. On the other hand, the budget share given over to the health care of other members of the household is lower in these households. This is probably due to the high level of expenditures incurred in looking after the person with AIDS. In households affected by AIDS, health care costs for other members of the household account for only 2.2 per cent of total expenditures; this is much less than the expenditures spent by Yopougon households under this heading (5.6 per cent).

In households where there is a person with AIDS, apart from the risk of the virus being transmitted because – as so frequently happens – the illness is not identified, particularly by spouses, the risk of other household members picking up the infection may be increased by reductions in the consumption of medical goods and services. In households with the most seriously ill people (i.e., where the person with AIDS died before the monitoring was completed) that patient's health expenditures accounted on average for 15 per cent of total expenditures compared to only 1.5 per cent spent by other members of the household.

These figures appear to support the hypothesis that an increase in health expenditures, together with an imbalance in those expenditures in favour of the person who is HIV-positive, is one of the main effects that the illness has on the pattern of household consumption. However, this analysis derives solely from a study of average consumption throughout the monitoring process. So the question remains – what direction are these expenditures taking?

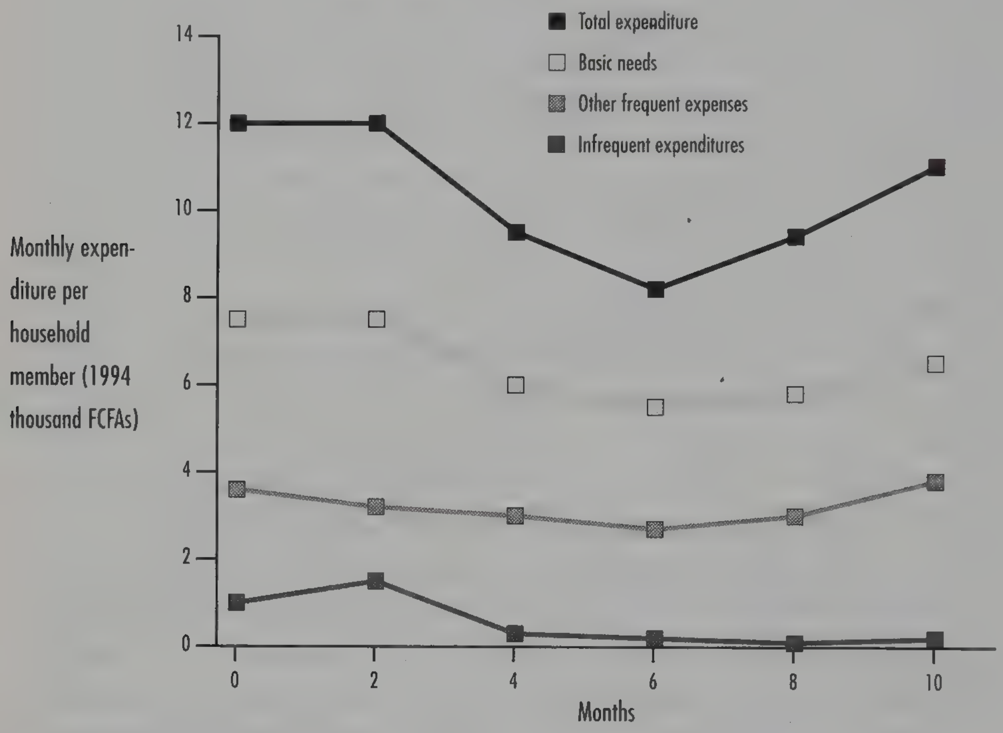
Section Three: Reduction in consumption by households affected by AIDS

The impact of AIDS on a household's expenditures depended a great deal on how sick the AIDS patient became during the course of the study. In the households in which the AIDS patient remained relatively free of symptoms, per capita consumption remained stable over time. But in the 29 households where the AIDS patient either died or moved away, per capita consumption first dropped, then appeared to recover partially (see figure 1).

3.1 A substantial fall in consumption during the first few months of the monitoring process

Examination of expenditures over the whole sample predictably revealed a substantial fall in average consumption per household member during the first year after AIDS was diagnosed. The average monthly consumption of monitored

Figure 1. The impact of adult illness on per capita household expenditure, Côte d'Ivoire



Source: Author's calculations.

households fell by a third between the first and fourth rounds of the survey and by 16 per cent over the whole monitoring period.

Grouping expenditures under broad consumption headings (basic expenditures, other current expenditures, exceptional expenditures, and the patient's health expenditures) reveals a general decline in consumption up to the fourth round. But there are considerable differences in the movements of these various expenditures.

3.2 A substantial decline in health expenditures and a temporary fall in current consumption on other than basic needs

The biggest reductions relate to

a the monthly consumption of health care by the person with AIDS, which fell by almost a half between the first and fourth rounds, and

b current expenditures (other than the consumption of bare necessities), which declined by 42 per cent during the same period.

Although the fall in current expenditures affects the trend in general consumption (on average they account for more than 28 per cent of total consumption), it is the fall in health expenditures that seems to reflect a real change in the pattern of consumption. Apart from a rapid decline in average monthly expenditures on health (a fall of one-half between the first and third rounds and of 41 per cent over the whole period), the fall in this budgetary item is also explained by a major decline in the number of people with AIDS consuming health care (through hospitalisation, consultations with practitioners of modern and traditional medicine, home care, and modern and traditional medication).

By way of illustration, whereas more than 95 per cent of those with AIDS and living at home were health care consumers during the first rounds, only 55 per cent were still doing so after 10 months; what is more, 29 had already died or had left their homes. The number of AIDS-related health care consumers therefore fell by more than half (from 99 individuals down to 43) during the monitoring period.

Although there is a striking fall in the consumption of medical goods and services of all types, this is particularly true of modern medicine: the percentage of patients living at home and having modern medicine consultations fell by almost 60 per cent between the beginning and the end of the survey, and the consumption of 'bio-medicinal treatments' dropped by almost half.

By contrast, there were very few cases of hospitalisation. In fact, not one person with AIDS was hospitalised during the last four months of the survey. Moreover, these falls were not compensated for by increased consumption of traditional medicine: in fact, consultations with traditional medical practitioners fell by more than a third, and the consumption of traditional medicines fell by 30 per cent.

These findings conflict sharply with the hypothesis that the consumption of care rises as the illness becomes more serious. They appear to reflect a degree of disinterest among persons with AIDS in the provision of care that cannot cure them. After the initial period when the illness is identified and there is frequent recourse to health care, most seem to distance themselves gradually from the structures of modern care – and, to a lesser extent, from traditional medicine – by cutting back on hospitalisation and medical consultations and the consumption of medicine. During the first six months of the monitoring exercise, the consumption of health care represented on average almost 12.6 per cent of households' current expenditures; during the last two months, it accounted for only 3.8 per cent.

However, the fall in average consumption of health care on its own fails to explain the overall decline in expenditures, because health care for the person with AIDS accounts on average for no more than 8.4 per cent of total expenditures for the entire period of the survey.

3.3 A gradual decline in the consumption of basic necessities is often linked to changes in the composition of the household and to the death of the person with AIDS

The fall in overall consumption also extended to basic needs, such as food, energy (water, oil, electricity, wood, and coal), accommodation, hygiene, and maintenance. During the course of the survey, this budget heading fell on average by almost a quarter, thereby pulling total expenditures down, since it accounted on average for more than half (53.4 per cent) of total expenditure. However, the fall in consumption of basic necessities was not uniform. It mainly affected households where a person with AIDS died or moved away. In the latter case, the fall was 30 per cent, compared with an average of 22 per cent in other households.

This decline is particularly disturbing because the budget item that underwent the biggest reduction in households where a person died of AIDS is food (minus 40 per cent between the beginning and the end of the survey). When combined with a major reduction in the health care expenditures of other household members, this fall in basic consumption represents a major crisis in these households, involving a change in their consumption choices, including the meeting of vital needs. Falling consumption appears to be mainly linked to the crisis brought about by the AIDS death. Changes in per capita consumption are insignificant in households where there are no instances of an AIDS death.

The fall in consumption expenditures during the first few months following detection of the illness and the beginning of medical care is substantial in most AIDS-affected households, but is especially so in households where the person with AIDS dies. However, a general upturn in consumption is observed after a few months.

3.4 An upturn in consumption at the end of the monitoring exercise: A temporary effect?

There was an upturn in consumption during the last two rounds (+25.4 per cent on average). Does this denote a return to earlier consumption habits after the shock caused by diagnosis of the illness and the reductions imposed on consumption choices? Or is it rather a question of a half-hearted or temporary upturn in expenditure?

Although it did not climb back to its original level, the recovery in overall consumption was very marked in respect to those current expenditures that were not linked to the meeting of basic needs. During the last two rounds, this expenditure item more than doubled for most households. By contrast, those monthly expenditures that were linked to basic necessities (i.e., food, hygiene, accommodation, water, gas, oil and electricity, and wood and coal) and to the health costs of the person with AIDS fell throughout the monitoring exercise, on average by 24 per cent and 76 per cent, respectively, in all households.

But nonbasic current expenditures, which declined sharply during the first few months of monitoring (minus 42 per cent between the first and fourth rounds), were actually higher at the end of the period than when the monitoring began (+16 per cent on average).

The upturn was largely associated with an increase in expenditures on clothing (+136 per cent during the last four months) and even more with an upturn in consumption linked to education, where, after falling away sharply in previous months, the total amount climbed back to the level it had achieved during the first round.

But the important point is that the upturn in these two expenditure items is mainly explained in terms of timing. It was not a fundamental change in consumption choices, nor was it a return to the initial situation. It was because the school year was commencing and households with children of school age faced expenditures that could not be reduced. So the upturn in average consumption noted at the end of the monitoring process did not really point to any refound confidence on the part of these households, but was rather a 'period effect' involving only a temporary increase in consumption.

3.5 Was there nevertheless a more durable, if still inadequate, 'upturn' in households confronting an AIDS death?

The relative upturn in consumption toward the end did not enable households coping with an AIDS death to return to their earlier levels of consumption. In households where the person with AIDS died or moved away, average global consumption fell by as much as 44 per cent despite the upturn observed at the end of the period. So the decrease in health expenditures made possible by a death (or departure) did not really prompt a return to a level of consumption comparable to the earlier level. The reason was to be found in more fundamental cutbacks on current expenditures incurred at the beginning of the monitoring, partly introduced to pay for the health costs of the person with AIDS. Nor was the upturn in these households toward the end sufficient to reestablish the average level of expenditure per individual.

In households where the person with AIDS was still living at home at the end of the survey, per capita consumption actually increased by a quarter during the exercise thanks to a rise of almost 40 per cent during the last four months. But in contrast, individual expenditures in households where that person died or moved away fell by 10 per cent over the whole period.

What seems to happen is that households where the person with AIDS has died tend to revise consumption habits that were disrupted by the death. They do this by limiting exceptional expenditures, including funeral expenses. For example, of the 24 households in question, only 19 committed funds to the organisation of funeral and other related ceremonies. Surveys in Zaire and Haiti show how funeral expenses there can represent more than 80 per cent of average annual per capita income and put a considerable strain on household budgets. In the monitored households of Côte d'Ivoire, however, they did not make any substantial contribution toward increasing expenditures.

So the presence of AIDS does have an effect on the basic consumption patterns of households, but the modification that it causes is not always sustained and varies from one household to the next. In all observed households, AIDS plays a key role in changes in household consumption.

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17

The impact of AIDS on household composition and consumption in Thailand

by Wattana S Janjaroen

Section One: Introduction

This paper examines two questions:

- What is the household structure, and what are the components of the household, in households with and without an adult death?
- Among households with and without an adult death, what are the factors affecting the change in household consumption?

The data used in this paper were generated from research on the economic impact of HIV/AIDS mortality on households in Thailand by Pitayanon, Kongsin, and Janjaroen (1993). The area of study was five districts in Chiangmai Province in the upper north of Thailand – Mae Rim, San Sai, San Kampang, Hang Dong, and Fang districts – where reported HIV/AIDS cases and deaths were among the highest in the country.

The study team selected sample households with AIDS deaths and non-AIDS deaths from among those deaths that had occurred in the public health facilities of the five districts. A sample of households without a death was also identified. A survey questionnaire was administered to each household. The household respondent was either the household head or his/her representative who could provide the information.

Section Two: Results

2.1 Household structure and composition at the time of the study (1993)

There were 361 persons in the households with an AIDS death or 3.11 persons per household (see table 1). This is rather low by rural Thai standards, but was partly explained by the recent death of a household member. The size of the households with a death from other causes was the same as in households with an AIDS death, but smaller than among households with no death, where it was four persons per household.

Table 1. Demographic characteristics of sample households at time of survey

	Age of head	Household size	Number of households
Death from AIDS	39.42	3.11	116
Death from other cause	34.14	3.11	100
No death	31.17	4.00	108

Households with an AIDS death had 60 per cent of their members in the prime working age (15–59 years) compared to 68 per cent and 69 per cent in households with a death from other causes and those with no death, respectively.

2.2 Household structure and composition prior to death

In order to establish the previous structure and composition of the households, joiners and leavers to/from the households were investigated. Only a few people had joined or left these households during the preceding period, but it was interesting that almost all of them were in the productive age group. Also, joiners and leavers were younger in AIDS-death households. Table 2 shows the average ages of the joiners and leavers.

Using the information on the number and ages of the joiners and leavers, it is possible to reconstruct both the raw and the adult equivalent household membership prior to death (table 3). The three subsamples of households looked very similar to one another prior to the death.

2.3 Household consumption

The previous study on the economic impact of HIV/AIDS mortality on households (Pitayanon, Kongsin, and Janjaroen 1993) revealed the negative impact of HIV/AIDS deaths on the household labour supply available for family support, because the majority of the HIV/AIDS deaths were males of prime working age. The survey asked respondents to estimate their household's total annual consumption expenditure and total annual consumption of each of the following components of consumption: food, clothing, entertainment, education, cigarettes, charity, and travel. By adding together the answers from these separate questions (imputing a zero for the missing answers), one can derive a separate estimate of total household consumption. Table 4 reports the average total annual consumption per household as computed in each of these two ways.

Average expenditure per adult equivalent household member can then be calculated by dividing the two measures of average household expenditure

Table 2. Ages of joiners and leavers

	Joiners	n	Leavers	n
Death from AIDS	22.6	8	27.4	10
Death from other cause	29.3	4	28.8	8
No death	29.0	1	32.0	6

Table 3. Household size at time of survey and earlier, by whether the household had a death and the type of death

	Household type			
	Death from AIDS	Death from other cause	No adult death	All households
At time of survey				
Number of households	116	100	108	324
Number of members in all households	361	311	432	1,104
Average household size	3.1	3.1	4.0	3.4
Average adult equivalent household size	2.7	2.7	3.6	3.0
Recent changes				
Joined	8	4	1	13
Left	10	8	6	24
Died	118	100	0	218
*Prior to deaths**				
Number of members	481	415	437	1,333
Average size prior to death*	4.1	4.1	4.1	4.1
Average adult equivalent size prior to death*	3.7	3.8	3.6	3.7

* The deaths all occurred within the previous year. For households with a death, 'prior to the death' means before the death occurred, whether that was a month ago or a year ago. The reference period for households that did not experience a death was left indeterminate.

by the average number of adult equivalent household members at the time of the survey. While all of these measures suggest that the households without deaths had higher consumption levels than those with deaths, the differences among the classes of households are very small and given the magnitudes of the standard deviations (not shown) are not statistically significant.

Table 4. Average expenditures at time of survey by type of household, using two measures of household expenditure

	Reported total household consumption		Sum of reported consumption components	
	Total	Per adult equivalent	Total	Per adult equivalent
Death from AIDS	27,937	10,347	31,982	11,845
Death from other cause	34,566	12,802	29,754	11,020
No death	45,212	12,917	44,808	12,802

Even if the groups of households displayed quite different average expenditure levels in table 4, it would not be clear whether the deaths had caused those differences. It might simply be the case that the members of poorer households are more likely to be visiting the public hospitals.

2.4 Explaining changes in household consumption

For the households that had experienced a death, the survey asked respondents to estimate the change in each component of consumption since before the death. By using regression analysis, it is possible to investigate the degree to which these reported percentage consumption changes are related to characteristics of the individual household or of the deceased person.

Five regression equations were estimated, in an attempt to explain each of the following consumption changes:

- absolute change in consumption per adult equivalent member (AEM)
- absolute change in food consumption per AEM
- absolute change in medical consumption per AEM
- per cent change in consumption per AEM
- per cent change in food consumption per AEM.

The explanatory variables used in all five regression equations were:

- the district where the household is located
- years of education of the household head
- occupation of household head
- relationship of the deceased to the household head
- age and age squared of the deceased
- sex of the deceased
- cause of death
- duration of illness.

Variables with positive coefficients in the regression equations can be interpreted as 'protective' of the household. Larger values of these variables are associated with smaller reductions or larger increases in consumption after a death. On the other hand, variables with negative coefficients are associated with greater vulnerability of the household, since households with larger values of these variables tend to experience larger consumption declines or smaller consumption increases after a death.

The regressions all are statistically significant at the 85 per cent confidence level or better. The education of the household head has a consistently positive sign across all five regressions and is statistically significant in regression 1 and marginally so in regression 5. Thus education protects households from some of the worst consequences of an adult death.

The sex of the deceased has a consistently negative sign across all regressions and is statistically significant or marginally so in three of the regressions. In view of the coding of the sex variable, this result suggests that the death of a female adult has a more strongly negative effect on consumption than does the death of a male adult. The statistical significance of sex in predicting the change in medical expenditure suggests that households spend less on the medical care of terminally ill women than on equally ill men.

After controlling for the other variables, AIDS deaths have a larger negative impact on consumption than do non-AIDS deaths. Furthermore, this is true even when controlling for the duration of the illness, which also has a strong negative effect in two of the regressions.

Section Three: General conclusions

The household structure and composition of AIDS-death households were different from the others:

- There was no difference in size between households that were to later experience an adult death and those that did not. All three groups of households in the survey had an average of 4.1 members.
- Households that had experienced a death showed little sign of being able to recruit a replacement household member and remained almost a full individual smaller than they had been prior to the death.
- The average composition of the AIDS-death households after the deaths was 15 per cent under 14 years old, 60 per cent in prime working age (15–59 years old), and 25 per cent elderly people. In non-AIDS death and no-death households, the percentages of persons in the prime working age group (68 per cent and 69 per cent, respectively) were higher than in AIDS-death households.
- The percentage of elderly people in AIDS-death households was higher than in other types of households.
- Education of the household head has a protective effect in the case of death, allowing affected households to experience smaller reductions in consumption.
- Deaths of adult women have a stronger negative impact on consumption than do deaths of adult men.
- Deaths from AIDS or those preceded by long illnesses are associated with a larger decrease in consumption than are those deaths from other causes.

These findings support the view that an AIDS epidemic will harm rural Thai households not only by causing many premature deaths that would otherwise not occur, but also by the severity of the impact of each of these deaths. The severity of impact is likely to vary by the socioeconomic status of the household, with poorer households whose heads are less educated suffering more than less poor households with more education.

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